The

Journal of Heredity

(Formerly the American Breeders' Magazine)

Vol. V, No. 4 April, 1914

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The Journal of Heredity is published monthly by the American Genetic Association (formerly called the American Breeders' Association) for the benefit of its members. Canadian members who desire to receive it should send 25 cents a year, in addition to their regular membership dues of $2, because of additional postage on the magazine; foreign members pay 50 cents extra for the same reason. Price of single copies, 25 cents.

Entered as second-class matter August 27, 1912, at the postoffice at Washington, D. C., under the act of August 24, 1912. Contents copyrighted 1914 by the American Genetic Association. Reproduction of articles or parts of articles permitted provided proper credit is given to author and Journal.

Date of issue of this number, March 26, 1914.

THE SMALL ARABI CLASS OF KARAKUL.

These ewes are the only two good ones secured by Dr. C. C. Young in his first importation of sheep from Turkestan. They are full-bloods of the Small Arabi class, which he considers one of the best for breeding purposes. The lambs beside them, from Teddy senior furnish skins worth as much as $12 each for fur. This photograph was taken by Dr. Davidson at the quarantine station, Athenia, New Jersey, while the importation was being held to detect the possible presence of surra or some of the other Asiatic sheep diseases which are justifiably feared, and the fear of which leads to the almost total prohibition of the importation of sheep from Asia. (Frontispiece.)

See "Breeding Karakul Sheep," page 170.

DIFFERENTIAL FECUNDITY

How Various Races of the United States Are Altering Their Relative Positions—Native Americans Dying Out in New England—Whites Supplanting Negroes in the South—Influence of Cities on the Birth-Rate.[1]

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HAVING been honored with an invitation to address you upon the subject of "differential fecundity as one of the causes of the need for race betterment," I have felt it both a privilege and a duty to accept the invitation.

At the start it is well to define *fecundity*. This is the more necessary because the definition used in biology and medicine differs somewhat from that used in statistics. The definition propounded by Professor Raymond Pearl in his paper before the First International Eugenics Congress at London in 1912 was as follows: "the innate potential reproductive capacity of the individual organism as denoted by its ability to form and separate from the body mature germ cells." For human statistics this definition is inapplicable and useless. Statistics disregards potential as distinguished from actual or realized fecundity and makes fecundity a characteristic, not of men or women, husbands or wives, but of marriages. For present purposes, then, it is a term applied to marriages which have proved fruitful in the birth of at least one child, and is thus the opposite of sterility.

In some technical discussions a distinction is drawn between fecundity and fertility, the former being applied indiscriminately to every marriage which has resulted in the birth of a child, the latter taking into account also the number of children born to the marriage. If we were to accept this distinction, two marriages, to one of which a single child had been born, and to the other of which six children had been born, would be equally fecund, for fecundity has no degrees, but the marriage which had resulted in six children would be more fertile than the other. In the present paper, which must be general in character, the distinction between fecundity and fertility will be ignored. For our purposes, fecundity means the yield of living births in any population group in a unit of time, usually a year. This yield can seldom be effectively stated as a total number of births, for such a number ignores variations in the size of the group which produces it. To avoid this difficulty fecundity is stated ordinarily as a proportion or ratio, called the *birth rate*.

WHAT DIFFERENTIAL MEANS.

The word *differential* also must detain us a moment. The differences which it implies are differences in the fecundity of various population groups and, in consequence, differences in the rates at which these groups perpetuate themselves and multiply by nature's processes of birth and death. The real things to be compared are the rates of increase or of decrease resulting from the balance between these natural processes. The birth rate or fecundity gives only one term when what is wanted is the difference between two terms, the birth rate and the death rate. A population group may increase either by excess of births over deaths, by excess of immigration over emigration, or by various combinations of these two kinds of change reinforcing or antagonizing each other. An increase by excess of

[1]Address delivered before the First National Conference for Race Betterment. Battle Creek, Mich., January 10, 1914.

births, or what is called natural increase, differs from an increase by excess of immigration over emigration, or migratory increase, in that it is more likely to carry on into the next generation through heredity the main characteristics of the parent stock. Where the group is increased by immigration there is less warrant for supposing that its qualities will be perpetuated.

My real theme, then, may be phrased as "Differences in the Rates of Natural Increase," a more accurate title than "Differential Fecundity." In addition to defining my subject more exactly, this has an incidental advantage. The fecundity or birth rate of the population of the United States is unknown; the fecundity of any of the numerous groups into which that population may be divided, with the possible exception of a few states, is likewise unknown. Neither do we know the mortality or death rate of the population of the United States, although we do know the death rate of many states and are rapidly advancing towards a determination of the rate for the entire country. These facts might seem to make a paper on "Differential Fecundity" or "Natural Increase" almost impossible. But if a group is unaffected by migration, its total increase at one date over the number at a prior date, determined from two successive censuses, is a measure of its natural increase. The population of the United States is far from satisfying this condition, yet within it there are certain groups, e. g., Negroes and Indians, so little affected by migration that we may measure their natural increase from census returns, though neither their fecundity nor their mortality is known. Even for the whites the effort to measure the natural increase by allowing for the increase due to immigration is not absolutely fruitless.

SCOPE OF THE PAPER.

My subject, then, assumes that the population can be divided into groups, the natural increase of which can be determined and compared, and my aim is to review the present state of statistical knowledge regarding the natural increase of such groups. The American population groups of whose natural increase I shall speak briefly are the white and the Negro races, the native and the foreign born, the several nativity strains among the foreign born, the urban and the rural population.

Among savage or semi-civilized people, the overwhelming majority of whom live little above the starvation point, there is a reciprocal relation between births and deaths. When the deaths increase, the births decrease; when the deaths decrease, the births increase. For example, in European Russia in the famine year, 1892, the deaths exceeded the annual average of the years before and after the famine by more than half a million, and the births in that year fell below the annual average for the years before and after by more than 300,000. Conversely, in such countries a bountiful crop lowers the death rate during the time the food lasts, and raises sharply the birth rate a few months later. Most civilized countries have emancipated themselves from this close dependence upon food and in them no relation can be traced between the crop of grain and the crop of babies. In such countries the only surviving relics of this reciprocal relation between births and deaths are found in cases of war and pestilence. Thus, in Massachusetts, the effect of the Civil War was apparently more marked in reducing the birth rate than in raising the death rate. The first of the recent epidemics of influenza, sweeping rapidly from Russia over Europe and her outposts in the winter of 1889-90, was the main reason that in nearly every civilized country 1890 was a year with a very high death rate. But no attention has been called to the fact that the births in Europe during that year were 200,000 below the average of the preceding five years, and that these losses of life by reduction of the births came in each country from eight to ten months after the mortality from the epidemic reached its height.

DECLINE IN BIRTH RATE.

During the last fifty years or less the most marked change in the birth rates and death rates of civilized coun-

tries has been the gradual decline and almost complete disappearance of this reciprocal relation between births and deaths, whereby the most significant changes were those between one year and the next and these changes were usually in opposite directions, and the appearance in its place of a tendency for birth rates and death rates to decrease slowly but steadily for a long series of consecutive years. The annual variations are much less, but the total change in ten or twenty years much greater than under the earlier conditions. Usually the decline began with the death rate and in that case its effect would necessarily be to magnify the natural increase. But a decline in the birth rate soon began and is proceeding now in most civilized countries about as fast as the death rate. Indeed, such a change was inevitable, if the natural increase was not to be more rapid than the increase in wealth or food. We must never forget that the decline in the birth rate and that alone has enabled mankind to hold fast the advantages promised by the advance of civilization and the sharp fall in the death rate. The serious and disturbing fact is not the mere decline in the birth rate, but the differential decline. Apparently many strains or lines of descent which one might most desire to see continued and increased are strains which are losing ground relatively, if not absolutely, by a decrease of the birth rate more rapid than that of the death rate.

The largest and in some respects the most important population groups about whose rates of natural increase I wish to speak this morning are the great races of man, the European, Asiatic, and African. Their increase has been and still is in the main dependent upon differences in the certainty and sufficiency of the food supply. The great reason for the rapid multiplication of the European folk and their descendants in other parts of the world from perhaps 130 millions in the middle of the eighteenth century, to more than 550 millions now, while during the same period the numbers of other races have altered but little, is found in the fact that new territorial discoveries and new methods of stimulating agricultural production and the transportation of persons and goods have concurred to increase enormously the supplies of food available for the white race. There is no reason to suppose that the fecundity or fertility of this race is greater than that of other races or greater than it formerly was; its natural increase has been unprecedented not because its birth rate has risen but because its death rate has fallen, and fallen more rapidly than its birth rate.

HOW THE NEGRO LOSES GROUND.

In our own country and especially in the southern states this divergence in rates of natural increase is working out results of interest for the two great races. That the white race is slowly displacing the Negroes in the United States is now well known. That this is due to differences in the rates of total increase is equally familiar. But the whites are being constantly reinforced by immigrants and the Negroes are not. Where migration is a potent factor, total increase is an untrustworthy clue to natural increase. For this reason we may get nearer the truth by confining attention to the southern states. Under the slavery régime and the saturnalia of reconstruction which followed, i. e., from 1790 to 1880, the increase of the two races in the South, and, so far as we may disregard the effects of migration and identify natural increase with total increase, their natural increase was at about the same rate. During this ninety years, when the Negroes were fewest relatively they were 35% of the total population of the South; when they were most numerous they were 38%, a difference of only 3%. But since 1880 the southern whites have increased much more rapidly than the southern Negroes and as a result the proportion of the latter is dwindling. In 30 years that proportion has decreased more than 6%, or more than 2% in each decade.

In the United States as a whole the more rapid increase of the whites is due not only to the influx of hundreds of thousands of white immigrants, but also

to the fact that in the registration area in 1910—an area including nearly three-fifths of the whites and more than one-fifth of the Negroes, and so a fair index of conditions in the country at large—the Negro death rate exceeded the white by about two-thirds. If the fecundity of the darker race likewise exceeded that of the whites by two-thirds, the difference in the death rates would not entail a different rate of natural increase. Although no exact measure of fecundity can be gained until there is an effective registration of births, a rough substitute for it has been found in the proportion of living children under five years of age to 1,000 women of child-bearing age.

NEGRO FECUNDITY.

Measured in this way, the fecundity of the American Negro is and has been for the 60 years since 1850 greater than that of the white. During the 30 years since 1880—and those are just the years within which the proportion of Negroes in the South has been falling—the excess in the proportion of Negro children over white children in the country has likewise been falling. The present difference in fecundity between the races is little more than one-fourth of that in 1880, and at present rates of change it will have disappeared entirely before the next census is taken. In the South the proportions of children in the total population and in each race are notably above the corresponding proportions in the North. Indeed it is probable that a main reason for the greater fecundity of the Negro race is found in the fact that this race, of which nearly nine-tenths live in the South, has the high fecundity characteristic of the South, and the white race, of which the majority live in the North, has the lower fecundity characteristic of the North. For in the southern states the proportion of children to women among whites already exceeds that among Negroes by 10%.

The evidence, then, points to a differential natural increase as an important factor, a factor in my opinion at least as important as immigration, in determining the present and future relative proportions of the two main races in this country.

Among the whites, the main classes whose differential fecundity has been somewhat studied, are the native and the foreign-born stock. This branch of the inquiry is difficult not only because of that lack of data which almost baffles one in studying the differential fecundity of white and Negro, but also because the lines between the two classes are fluid and variable. A son born of immigrant parents the day after their landing is of the same stock as they, yet in the statistical tables he stands as a native American and they as foreign-born or immigrant. Although efforts have been made to measure the proportion of the white population of the United States at the end of the nineteenth century which sprang from the whites who were in this country at its beginning, and the proportion due to immigration during the century, yet none of the results seems to have won or to be entitled to general acceptance, and for that reason I must pass this topic as still a happy hunting ground for conjecture.

CHANGES IN MASSACHUSETTS.

A careful and illuminating study of the comparative fecundity of the native and foreign-born population of Massachusetts and of the various strains of the foreign-born in that state during the 15 years, 1883-1897, was made in 1901 by Dr. R. R. Kuczynski.[2] The proportion of married women who had outlived the child-bearing age without having borne any child was 9% among the foreign-born, and 15% among the native, indicating that the proportion of sterile marriages is about two-thirds greater among natives than among foreign-born. The average annual number of births among 1,000 immigrants was more than three times as great as among 1,000 natives of the United States. But a large proportion of the natives and a small proportion of immigrants are children, and for this reason a fairer comparison of fecundity was secured by excluding the children both

[2]In the *Quarterly Journal of Economics* for November, 1901, and February, 1902.

from the native and from the foreign-born. After this correction has been made, the fecundity of the foreign-born was found to be a little more than twice that of the native. The birth rate varied with the place of birth of the mother, the lowest rate being found when the Massachusetts wife was born in some other New England state; the highest rate when the Massachusetts wife was born in Portugal, the latter rate being more than four times the former. When all women over 50 years of age and all younger unmarried women were excluded, the birth rate of foreign-born wives was found to be greater than that of the native by about three-fourths.

Another study of the fecundity of married women in New Hampshire, comparing native and foreign-born wives, and introducing a classification by age, added the interesting result that, while the birth rate of foreign-born wives at all ages was twice that of native wives, this was a resultant or average of differences which grew steadily greater with the age of the classes compared. The birth rate of foreign-born wives at ages under 20 exceeded that of native wives by less than one-fourth, but at ages 25 to 34 it was more than double and at ages 35 to 44 was almost treble that of native wives.[3] This suggests that a large part at least of the difference between the fecundity of the native and the immigrant stock in New Hampshire is due to psychological rather than physiological causes, or causes which express themselves in the voluntary choice of small families rather than in sterility. An attempt to estimate the comparative fecundity in 1900 of native and foreign-born women in the United States, including wives and spinsters and with no allowance for differences in age distribution, indicated that the fecundity of foreign-born women exceeded that of native women by more than 50%.[4]

The statistics of Massachusetts, although they were probably as good as those of any state, did not and do not yet afford the information needed for a thorough study of the death rates, and so of the difference between birth rate and death rate, or natural increase, of the native and foreign-born, but a comparison of the existing material with that furnished in Berlin, where a similar problem has been studied perhaps as carefully as anywhere in the world, led Dr. Kuczynski to conclude that the native population of Massachusetts is probably dying out at a rapid rate.

NATIVE POPULATION DYING OUT.

Since his articles were written, material has accumulated making it possible to compare the mortality of the native and the foreign-born in 1900 in the registration area of the United States, which embraced two-fifths of the population of the country and much more than that proportion of the foreign-born, and in 1910 in New York State.[5] These results show that for ages between 10 and 40 there is very little difference between the death rates of natives and of foreign-born of the same sex and age, and that what differences do exist are quite as often in favor of the foreign-born as the native. Since the fecundity of the foreign-born is at least 50% greater than that of the native, and the mortality is about the same, the difference between them, or the natural increase of the foreign-born, must be far above that of the native population.

Another classification of the population has been employed in studies of differential fecundity, that into the urban and the rural population. Under urban is included all residents of cities each having at least 25,000 inhabitants, all the rest of the population being treated as rural. The division line of 25,000 is much too high, but the form

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[3]A. A. Young, "Birth Rate in New Hampshire," in American Statistical Assn. *Quart. Pubs.*, IX:280 (September, 1905).

[4]Twelfth Census, *Supplementary Analysis*, p. 420.

[5]This is the only fact brought out, I believe, for the first time in the present paper. The results for New York State in 1910 will be found in my last report as consulting statistician to the New York State Department of Health; the confirmatory results for about forty per cent. of the population of the United States in 1900 have been computed from a ms. table kindly furnished me by the Census Bureau.

of the printed tables makes it impossible to put the limit lower. The fecundity of city women between 15 and 44 years of age is only about two-thirds that of country women. But in the United States cities are massed at the North, and the North has a low fecundity. The low urban fecundity, then, may be due to the northern location and not to city life. To test this, a comparison has been made between the cities of the North and the country districts of the North, and between the cities of the South and the country districts of the South. Such a comparison indicates that in all main divisions of the United States fecundity in country districts is greater than fecundity in cities It indicates also that the difference between city and country in this respect is at a minimum of about 10% in the North Atlantic group and at a maximum in the southern groups where rural fecundity is about double urban fecundity. This geographic difference may be plausibly explained as due to the numerous immigrants in Northern cities and their high fecundity, and to the numerous Negroes in Southern cities and their low fecundity. For the fecundity of city Negroes is only about two-thirds the fecundity of city whites, but the fecundity of country Negroes is much above that of country whites. The growth of cities, especially in the South, and of a Negro urban population seems likely to increase the differences in the fecundity of the two races.

FECUNDITY OF IMMIGRANTS.

The twenty-eighth volume of the Report of the Immigration Commission, printed in 1911, contains a contribution to our subject entitled, "Fecundity of Immigrant Women," the main conclusions of which have been summarized by its author in an article in the last issue of the *Quarterly Publications* of the American Statistical Association.[6] The tables were compiled from manuscript data in the United States Census Bureau and deal in the main with nearly 80,000 married women under 45 years of age living in the second decade of married life and with the number of children they have had.

This is the most important American study of fecundity, and supplements in many ways what we previously knew. It classifies white wives as native of native parents, native of foreign parents, and foreign-born, and adds scanty data about Negro wives. Of the Negro wives who had been married between 10 and 20 years, one in five had had no child; of the native white of native parents, one in eight; of the native white of foreign parents, one in 16; and of the foreign-born wives, one in 19. The proportion of sterile marriages was determined for the various nationality classes of the foreign-born; it is highest among wives born in Scotland or England; lowest among wives born in Poland, Bohemia or Russia; and the proportion of sterile marriages among those where the wife was born in one of the first mentioned countries is about four times as great as among marriages where the wife was born in a country belonging to the second group. Among no group of foreign-born wives, however, is the proportion of sterile marriages as great as among marriages where the wives were born in the United States.

With reference to the average number of children born to these groups of wives of various countries of birth, the smallest number is to wives of native American birth and parentage. Ten such marriages have resulted in 27 children; 10 Negro marriages in 31 children; 10 marriages in which the wives were born in England, in 34 children; and at the other extreme, 10 marriages with wives born in Russia, in 54 children; 10 with wives born in French Canada, in 56; and 10 with wives born in Poland, in 62.

The average interval of time elapsing between births is for wives born in the United States, 5.3 years; for wives born in Poland, 2.3 years. This interval between births is uniformly greater in the second generation of immigrants than in the first. But the proportion of sterile marriages does not rise simi-

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[6]Joseph A. Hill, "Comparative Fecundity of Women of Native and Foreign Parentage," in Am. Stat. Assn. *Quart. Pubs.*, XIII: 583-604.

larly. So the tendency is to a reduction in the size of families rather than to a larger proportion of sterile unions.

FEWER BIRTHS IN THE CITY.

The influence of rural conditions upon fecundity is best measured by the statement that among wives born in this country of native parents and married between 10 and 20 years, 10 living in urban districts have had on the average 24 or 25 children, while 10 living in rural districts have had on the average 34 children, indicating that the fecundity of wives of a given nativity class living in the country is about two-fifths greater than it is in the city.

Perhaps the most important body of information regarding differential fecundity or comparative rates of natural increase in the United States has been secured as an immediate or remote result of the addition to the Massachusetts census schedule of 1875 of the question, "Number of children borne by women," the object of which "was to ascertain the relative fecundity of women of different nationalities and to settle . . . the question which continually arises concerning the growth of our native population as compared with that of our foreign born."[7] Ten years later similar information was sought in fuller detail by asking of each married woman two questions: "Mother of how many children" and "Number of those children now living." The results of tabulating the answers to these questions were carefully analyzed in the state census and were also of importance to Dr. Kuczynski in the preparation of his articles. The interest aroused in these questions and their answers was so great that five years later, in 1890, the same questions were placed on the schedules of the United States census, but unfortunately no tabulation of the results was ever made. In 1900, after much consideration by the office, the same questions were asked again, and again, after much preliminary work had been done upon the answers, the work was discontinued and no results ever reached the public except for the fragmentary tabulation made by the Immigration Commission and applying to about 4% of the population.

VALUABLE DATA NEGLECTED.

Yet again at the census in 1910 these questions were repeated a third time and in the Report of the Director of the Census to the Secretary of Commerce and Labor for that year one may read the following passage: "It is also proposed . . . to work out from the returns on the schedules statistics with regard to fecundity as indicated by the number of children born and the number living for women of different classes in comparison with their age and the duration of marriage. . . . A considerable amount of preliminary work on this subject was undertaken at the census of 1900 but the results were never tabulated or published. It is respectfully suggested that the Secretary recommend to Congress that the Director of the Census be authorized to tabulate the more important information on this subject for the 1900 census as well as that for 1910. . . . This subject is one of profound importance and the census schedules furnish data by which conclusions of the utmost value can be readily drawn. A plan has been devised by which the expense of . . . tabulating the results on this subject for the census of 1910 will be much less than would have been necessary to complete the work on the lines begun in 1900."[8]

At the present time no funds are available for completing this work and there is danger that for the third time the inquiry will suffer shipwreck. This investigation has been imitated abroad, some of the most interesting and significant results of the last French census and also of the last British census being derived from the answers to similar questions. In my opinion the failure to utilize the answers to these questions was one of the main defects of the census of 1890, was the most serious defect of the census of 1900 and now bids fair to be the most serious

[7]Mass. Census of 1875, Vol. 1, p. xli.

[8]Report of the Director for 1909-10, pp. 45-6.

defect of the census of 1910. In Dr. Hill's paper already quoted, and written a few weeks ago, we read: "It is to be hoped . . . that the returns obtained at the census of 1910 will not be similarly neglected, but as yet no steps have been taken towards their tabulation." If it had been the policy of this conference to adopt resolutions or make recommendations, I should have proposed the adoption of some such resolution as the following:

Resolved, that the National Conference on Race Betterment appoint a committee with power

1. To memorialize the Congress of the United States in the name of this Conference, urging it to provide the funds needed for compiling the returns now on the schedules of the census of 1910 and thereby measuring the fecundity of the races and national elements within the United States;

2. To attempt to secure the presentation of similar petitions from other organizations or from individuals interested in this subject.

Whether such a resolution would be welcome or not, I sincerely hope that individuals will write to individual congressmen urging such action as is here proposed.

In my judgment, no statistical result could come from this conference more valuable than a concerted effort to increase the available information regarding the comparative fecundity of the various strains in our population, for this information lying unused in the government files is of more value and importance than the entire sum of knowledge on differential fecundity now possessed by the American people.

The Need of Accuracy

Legislation with regard to the sources of racial degeneracy is certain to become more and more frequent in the near future; the idea of race betterment is not the monoply of a few faddists and cranks; it is growing to have an almost religious significance with a large number of persons in this country [England] and the movement foreshadowed by the present Mental Deficiency Act, is certain to grow apace whether or no it be backed by a scientific study of degeneracy. Shall there or shall there not be an accurate science of eugenics on which we can base legislative action? Shall we be content with mere expressions of opinion, with slipshod data, and with inaccurate treatment of even such material? The only answer possible is that we cannot be satisfied with such a condition of affairs in the case of man. The service of man demands the very best that science can produce, and those of us who have the highest hopes for the new science of eugenics in the future are not a little alarmed by many of the recent contributions to the subject which threaten to place eugenics with the older "social science" and much of modern sociology—entirely outside the plane of true science. Eugenics ought to be an accurate description at worst, a quantitative and exact appreciation at best, of the biological forces which control the evolution of national welfare.—David Heron: Mendelism and the Problem of Mental Defect (1913).

Eugenic Civilization

The best form of civilization in respect to the improvement of the race, would be one in which society was not costly; where incomes were derived chiefly from professional sources, and not much through inheritance; where every lad had a chance of showing his abilities, and, if highly gifted, was enabled to achieve a first-class education and entrance into professional life, by the liberal help of the exhibitions and scholarships which he had gained in his early youth; where marriage was held in as high honor as in ancient Jewish times; where the pride of race was encouraged (of course I do not refer to the nonsensical sentiment of the present day, that goes under that name); where the weak would find a refuge and a welcome in celibate monasteries and sisterhoods, and lasty, where the better sort of emigrants and refuges from other lands were invited and welcomed, and their descendants naturalized.—Francis Galton: Hereditary Genius (1869).

ALASKA'S REINDEER INDUSTRY

Peninsula Could Provide Grazing for Millions of Animals, in Region Where Cattle and Sheep Will Not Thrive—Meat Excellent and Brings High Price—Herd of 40,000 Now Exists, as Result of Importations by Government.

LEVI CHUBBUCK,
Agriculturist, Office of Farm Management, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C.

IN 1851, sixteen years before Alaska was purchased from Russia by the United States, Professor S. F. Baird, in a paper printed in the Agricultural Report of the United States Patent Office, advocated the importation of the domesticated European reindeer to Alaska for the benefit of the natives, whose means of subsistence by hunting and fishing, were being greatly diminished by the white men. Professor Baird expressed the opinion that the American caribou, native in Alaska, was as capable of domestication as the European species, but to avoid loss of time and save the people from the vicissitudes that were rapidly sweeping them off, he suggested the establishment of herds of the imported animals. Such a step, he said, would be of vast benefit to the Indians of the North, and might in the end lead them to become a pastoral people.

Twenty years after the purchase, which was in 1867, Charles H. Townsend took up the matter and advised that the government import reindeer, teach the natives how to care for and use the animals, and give them a start with herds.

Forty years after Professor Baird suggested the idea, the first move was made to act on the suggestion, when, in 1891, the late Dr. Sheldon Jackson, general agent in Alaska of the Bureau of Education, took hold of the proposition. Aided by donations from private sources, he purchased a small herd of European reindeer which arrived in Alaska in 1892. Successive importations brought the total to 1,280 head, which number has increased to about 40,000 at the present time.

W. T. Grenfell, the well-known missionary in Labrador, has succeeded in getting reindeer from Lapland introduced in Labrador and northern Newfoundland, and W J. Carroll, of Newfoundland, says: "It is to be hoped that the introduction of reindeer will be the first step towards the domestication of our own caribou."

THE REINDEER'S WILD RELATIVES.

David E. Lantz, in Bulletin No. 36, of the Biological Survey, U. S. Department of Agriculture, speaks of several species and local races of caribou or reindeer that inhabit the northern part of North America, which he divides into two groups according to habitat. The more northern group, which ranges beyond the forests, is represented by the barren-ground caribou (*Rangifer arcticus*). The second group is found in the forested area south of the other, and is represented by the woodland caribou (*Rangifer caribou*). They differ but little, Mr. Lantz says, from the old-world reindeer (*Rangifer tarandus*) in habits and general appearance, although no attempts to domesticate the American reindeer seem to have been made.

While, so far as the writer knows, no systematic effort has been made to test the matter, it is alleged that there have been instances of cross breeding between the domesticated reindeer and the native animals. This would not naturally take place except when both species were in captivity; but if such cross-breeding is a fact, it indicates that the blood of the wild caribou might be used to good advantage, should there be need of building up the reindeer herds. There is evidently already need of work along

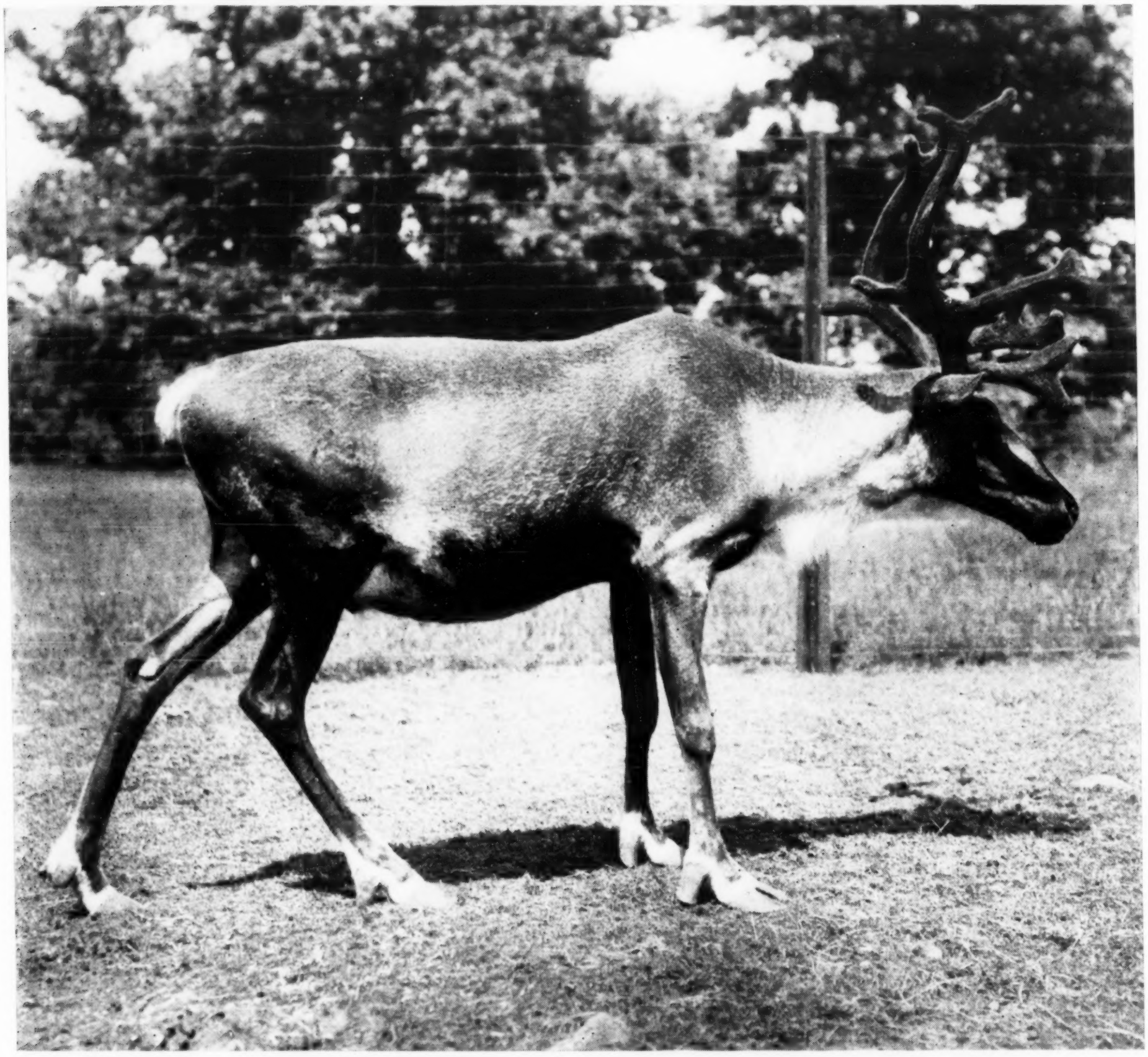
AN OLD MALE SIBERIAN REINDEER.

The reindeer is the only member of the deer family that has been domesticated, and shares with the dog the honor of being the only domesticated animal of the far North. Its genus (*Rangifer*) is the only one of the deer family in which the females, as well as the males, regularly possess antlers. Under ordinary conditions it lives to the age of 10 or 12 years, and furnishes food, clothing and labor to its native owners. It can draw 250 to 300 lbs. on a sled and travel all day at the rate of 10 miles an hour: its pace is an awkward, straddling walk, rarely a gallop. (Figure 1.)

this line in some districts where it appears that from lack of care in the selection of breeding animals, the domesticated deer are decreasing in size and developing other signs of degeneracy. The native caribou are superior in size and vigor to the imported animals. There seems to be no evidence as to whether they can actually be domesticated, but there should be no difficulty in employing them to infuse new blood into the herd of tame deer, should that seem desirable.

MUCH LAND AVAILABLE.

Here would seem to be an opportunity for some broadly conceived scientific and practical government work of large economic possibilities: A region sparsely occupied by a worthy and needy race,



AN OLD MALE WOODLAND CARIBOU.

An adult buck weighs from 350 to 400 lbs., and at the beginning of autumn carries a thick layer of fat on the back and rump, which furnishes a highly prized article of food to natives. Sir John Richardson says: "The flesh is tender and its flavor, when in season, is in my opinion superior to that of the finest English venison; but when the animal is lean, it is insipid, the difference between lean and well-fed caribou being greater than one can conceive, who has not had an opportunity of judging." Zoologists now divide the caribou, distinguishing a dozen species in North America; the one shown here is the Newfoundland Caribou (*Rangifer terranovae*). Photograph made at the New York Zoological Park. (Figure 2.)

the Eskimo, whose means of living have become very much restricted in recent years, and who make excellent reindeer herdsmen; the nucleus of an animal industry in the 40,000 reindeer now owned largely by the Eskimo; and a region practically unoccupied, with perhaps 100,000 square miles of pasturage suitable for the reindeer; at any rate sufficient to sustain herds reaching into the millions in number. In the April, 1903, number of The National Geographic Magazine, the editor, in an article on "Reindeer in Alaska," said: "In thirty-five years the number may reach 10,000,000 head."

It may be worth while to note in this connection, that in the two northern countries of Sweden, Norrbotten and Vesterbotten, comprising 63,000 square miles, the Lapps own 230,000 reindeer. Large herds are also owned in the north of Norway and in Finland.

The western half of Alaska, including

all the territory north of the Yukon River, is the region best suited to the reindeer, and it is also the section in which other agricultural opportunities are the most meagre and conditions for home making least favorable. A development of the reindeer industry can therefore be had without encroaching on districts where other lines of farming are more feasible. The white reindeer moss (*Cladonia rangiferina*) is found in all the arctic region of Alaska, on the Seward Peninsula and the tundras of the western portion of the territory, and in the mountains of the Alaska range and of the Alaska peninsula. Its existence not only permits the occupancy of vast regions that would otherwise be practically uninhabitable, but makes possible the production of a food supply of large economic importance.

LITTLE CARE REQUIRED.

The existence of great herds of native caribou that have grazed, and are yet found in considerable numbers in regions north of the Yukon River, and in various other parts of the peninsula as well, indicates clearly the kind of animal husbandry feasible in that part of Alaska. By building on nature's foundation, a great domestic animal industry may be established in regions where the climate does not favor the introduction of cattle and sheep. The reindeer subsist on the native herbage, principally the reindeer moss, winter and summer, require no shelter and little care beyond being restrained by a herder from wandering. The reindeer meat is of excellent quality, and the skins are valuable. Little attempt has thus been made to use the deer for dairy[1] or transportation purposes, as is done in Europe.

The larger proportion of the reindeer now in Alaska are within 200 miles of Nome, and nearly one-half of all are on the Seward Peninsula. From that district the herds are scattered as far north as Point Barrow on the Arctic Ocean, south to points on the Alaska Peninsula, and eastward up the Yukon River to Tanana, which is about midway between the Canadian boundary and the west coast.

At present the individual ownership of reindeer is restricted to Eskimos and Indians, with the exception of a few Lapps who were brought in with the original importations as caretakers, instructors and herders. Some of the missions are still in possession of herds, and there are a few government herds. No breeding deer are allowed to be sold to whites. The Alaska Division of the U. S. Bureau of Education, Department of the Interior, has supervision of all the herds, the teachers of the government school for native children located nearest a herd having immediate charge. In 1911 one hundred carcasses of deer were shipped to Seattle from Nome, and the meat sold at 75 cents a pound.[2]

INCREASE NOW SLOW.

Thomas A. Powers, of Unalakleet, Alaska (near St. Michael), in a letter to the writer dated August 16, 1912, says the increase in number of reindeer is only one-half that of cattle, due, he thinks, to the unscientific management introduced by the Lapps and followed by the natives, and to permitting the latter to dispose of young deer. He expresses the opinion that the government should, if possible, appraise the deer held by the Lapps and missions, buy them and distribute to the natives, and then put the industry in charge of a capable American cattleman, with a corps of able assistants, who would handle it on a scientific basis. "The reindeer industry is, as you know, in its infancy," he concludes, "and, not-

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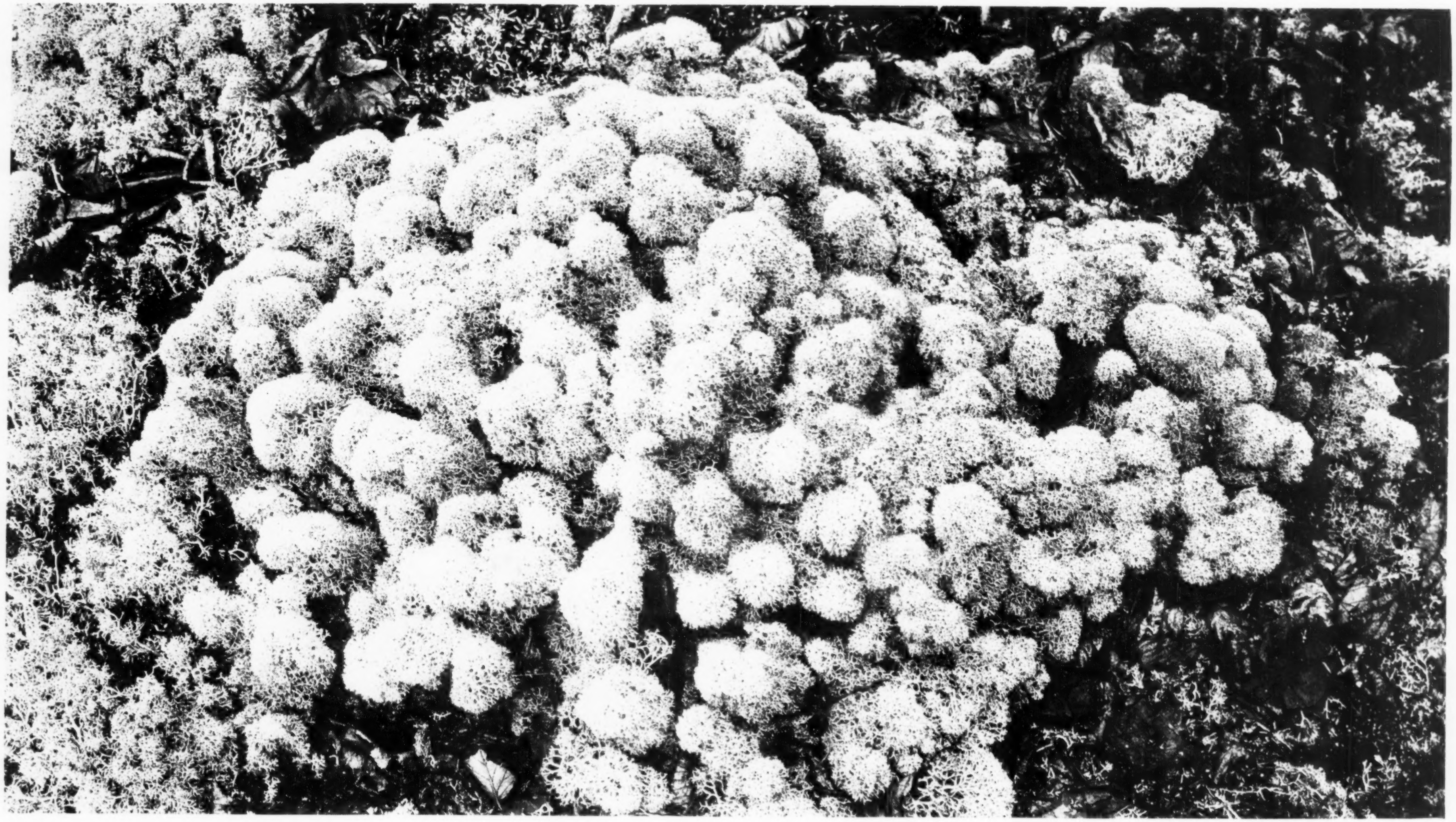
[1]The reindeer is milked by the Lapps once or twice a day, furnishing only a cupful at a time, and this "comes hard." The milk is so thick that it must be diluted for drinking; it is correspondingly rich, but has a strong flavor and odor, somewhat like the milk of goats. Butter from it tastes like tallow, and is little used, but much cheese is made. The does are fresh in the spring, when they produce their fawns, one or two in number. In Alaska the animal is rarely milked.

[2]Up to the present, local markets in Alaska have been able to use all the reindeer meat available, butchers buying the animals dressed at about 25 cents a pound. Reindeer may profitably be killed at the age of seven or eight, when they have outlived their greatest usefulness for transportation purposes. They are broken at the age of two. The average Alaskan carcass weighs about 130 pounds, dressed.



REINDEER MOSS IN MINNESOTA.

Strictly speaking it is not a moss at all, but a lichen (*Cladonia alpestris* in this photograph; *C. rangiferina* is quite similar). Sometimes it forms masses a foot thick. The reindeer usually eats nothing else during the winter, while the native, when he kills an animal, takes the half-digested moss from the stomach and eats it as a relish and anti-scorbutic. Photograph furnished by Professor Bruce Fink, Miami University. (Figure 3.)

withstanding its early mismanagement, gives promise of a mighty industry, and should be carefully fostered so that in years to come the states could rely upon an ever-increasing supply of reindeer meat. To do this, means should be used to stop waste and decrease casualties, and this will never be so long as the Lapps and missions hold so large a number of deer, and the natives, who do not look to the future, are permitted to handle the deer as they will."

Japhet Linderberg, president of the Pioneer Mining Company, Nome, Alaska, a recognized authority on reindeer, says the tundra fires, in destroying large areas of moss, are a great menace to the reindeer industry. These fires are very extensive all through the interior, where the light precipitation and the peaty character of much of the area permit them to smoulder and burn until not only all the vegetation, but much of the soil is destroyed.

NEW PUBLICATIONS

REPORT OF THE COMMITTEE TO STUDY AND TO REPORT ON THE BEST PRACTICAL MEANS OF CUTTING OFF THE DEFECTIVE GERM-PLASM IN THE AMERICAN POPULATION, by Harry H. Laughlin, Secretary of the Committee. Vol. I, The Scope of the Committee's Work, Vol. II, The Legal, Legislative and Administrative Aspects of Sterilization. Eugenics Record Office Bulletins Nos. 10A and 10B, Cold Spring Harbor, Long Island, February 1914. Vol. I, 64 pp., 20 cents; Vol. II, 150 pp., 60 cents.

"The investigation reported in this series of studies was initiated at the second meeting of the Research Committees of the Eugenics Section of the American Breeders' Association at Palmer, Mass., May 2 and 3, 1911." Following the reorganization of the American Breeders' Association, the committee continued its work independently under the chairmanship of Bleecker Van Wagenen. The other members are now W. H. Carmalt, Everett Flood, H. W. Mitchell and H. H. Laughlin, and they are assisted by a staff of 20 expert advisers on different phases of the problem, which they have undertaken to study from every point of view. The two bulletins under consideration are preliminary in nature; "in the subsequent reports of this committee," it states, "we propose by the means of first-hand facts, a considerable body of which has already been secured and studied, to present to the public data for weighing the several problems which appertain to this investigation."

According to the first volume of the series, the committee proposes that the lowest tenth of the population of the United States be "cut off" during the next two generations, by an extension of institutional care, i. e., "life-long segregation," complemented by sterilization wherever necessary. The second volume takes up the latter part of the problem, and analyzes in an exhaustive way its present status. All laws which have been passed with the object of dealing with this aspect of cacogenics are quoted in full; opinions of experts are given as to their constitutionality; in cases where they have been attacked before the courts, extended accounts of the cases are given; and finally, the committee submits a "model law" of its own.

It is interesting to note that in spite of the great amount of discussion of this supposed cacogenic remedy, which has been carried on during recent years, and the laws passed in 12 states to apply it, the committee estimates that less than 1,000 legal operations have been performed under these laws to date. It is declared, indeed, that more operations "have been performed without the sanction of the law than have been performed under its provisions, or even under its shadow." As is well known, California is the only state where the law is at present being enforced, the other 11 states having formally or informally abandoned the project, either in response to public sentiment, or because of adverse decisions of the courts.

THE EXISTENCE OF SPECIES

**Organization through Interwoven Lines of Descent a Characteristic of Species—
Biology Not Advanced by Ignoring this Fundamental Condition—
Eugenics a Problem of Maintaining the Species, rather
than of Separating Varieties.**

O. F. Cook,
Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C.

THAT all the plants and animals are organized into species is a fundamental fact of biology. If the organization of species were confined to a few groups of plants or animals it would have been considered very remarkable and would have been made the subject of special investigation. But being universal and altogether familiar, the existence of species is taken entirely for granted in some branches of biology and as completely disregarded in others.

Darwin had deeper insight into the problems of evolution and heredity than many of his successors, because he saw that these problems relate to species; that is, to species in the sense of natural groups of interbreeding organisms. Taxonomic complications regarding species have been allowed to confuse the issues to such an extent that current writers on general biological problems leave the phenomenon of specific organization entirely out of account or even deny that species have any real existence. A single instance may serve to illustrate this tendency:

> "We have devised a scheme whereby we regard animals as segregated into a series of groups—species, genera and so on—subordinated one to another. We arbitrarily separate these groups by sharp lines. While the scheme expresses, to some extent, our ideas concerning the past history of animals, the groups themselves have no real existence 'in nature,' as we say. There these sharp lines do not exist. The species or other group has no definite limits in space, no form, no integrity. It has no organization as a whole."

Plants and animals can be investigated in many ways without taking account of the organization of species. The interwoven lines of descent that bind the members of a species into a coherent organization may be separated, as in the breeding of varieties of our domesticated plants and animals, and endless experiments can be made with such varieties without considering their derivation from an ancestral specific organization. Many investigators prefer to study varieties rather than species because varieties have more uniform characters and more definite differences, so that the results of experiments are more readily reported in statistical form. When this preference is taken into account it is not surprising that theories of heredity should have been based upon facts drawn from the study of varieties, without considering the organization of the species.

THE SPECIES IN EUGENICS.

As long as our interest is limited to the varieties that are brought into the garden or the breeding pen for experimental purposes, it may appear better policy to avoid reference to species, but in the study of eugenics this policy can hardly be maintained, for eugenics does not have the same purpose of developing specialized uniform varieties. The problem of eugenics is to learn how to improve the human species in other ways, without destroying individual diversity or the normal network of descent. Human progress, to be permanent and secure, must be made in normal evolutionary ways, instead of by any direct imitation of the method of producing our short-lived varieties of domesticated plants and animals. Hence

a recognition of the existence of species and an understanding of the organization of specific groups would seem to be necessary steps in the development of a science of eugenics. To overlook the specific organization of living matter is to leave out of account the fundamental and unique condition of organic existence and of evolutionary progress.

The obvious purpose of the study of evolution and heredity is to understand how the complex and highly specialized bodies of plants and animals have been built up, and how they are rebuilt in each generation. From an evolutionary viewpoint, it is apparent that the cellular organizations represented in the bodies of plants and animals have developed through the association and differentiation of cells, and that progress in cellular evolution is dependent upon the organization into groups of interbreeding individuals, the groups that are usually called species.

Among the lowest forms of life the individual organisms are merely single cells, and the cells are all of one kind, and all of these cells taken together constitute the species. Organization, in the sense of building up cellular structures, begins when the cells associate in colonies, instead of living as separate unicellular individuals. After the habit of living in colonies has become established, the species is thought of as made up of colony individuals, rather than of cell individuals. In other words, the specific organizations of single-celled organisms furnished the materials for making colonies and building higher types of cellular structures.

PROGRESS THROUGH DIVERSIFICATION.

The next stage of organization is reached when the members of a colony of cells are not all of the same kind, but become specialized in form and function. The building up of the higher types of cellular organization involves the association of vast numbers of cells. The specific organization and the cellular organization have made mutual progress. Special systems of reproduction have been developed, making it possible to build up these highly complex forms of organization. It has not been sufficient to have different kinds of cells to make up individual organisms. Diversification has been raised, as it were, to the second power, in that different kinds of polycellular individuals are represented in the specific organizations. Sexual and other forms or diversity among the members of species have developed in all of the higher groups, to accompany increasing specializations of cellular organization.[1]

The dependence of the cellular organization upon the specific organization continues and becomes more apparent as we ascend in the scale of the structural complexity, and is shown by the need of crossing of lines of descent through sexual reproduction. The species and the individual are morphological facts, and sexuality the physiological function that connects them. The species is a network of interwoven lines of descent and has as real an existence in nature as an individual animal or plant. The species produces the individual and the individual adds its share to the network of descent of the species. To think of the individual as producing itself without reference to the specific organization is like assuming the spontaneous generation of a complex cellular structure.

The true nature of a species as represented by a network of descent is not apparent if we consider only the few individuals that may be taken to represent the species at a particular moment of time. In order to see the network we must visualize the past and the future, in accordance with the facts of organic succession. Narrowing our view of a species to a short period of time is like focusing our attention on the cross-section of a fabric. This enables us to examine the free ends of the individual threads, or to study an occasional knot, but we lose sight of the network as a whole.

THE SPECIES UNDERLIES ALL.

There is no structural organization without underlying specific organiza-

[1]Cook, O. F., and Swingle, W. T. Evolution of Cellular Structures, Bulletin 81, Bureau of Plant Industry, U. S. Department of Agriculture, 1905.

tion. Organisms maintain their existence and make evolutionary progress only in species. It is the species, rather than the individual, that has a truly biological existence. Evolution and heredity are collective, superorganic processes, hardly to be understood from the standpoint of the individual organism. Instead of disregarding species, students of general biological problems should consider the association of all plants and animals in species, in other words, the speciety of living matter, as one of the most significant and fundamental facts. That this condition or property of speciety is not analogous to any of the physical and chemical properties of unorganized matter, should give it a special interest for the biological investigator.[2]

The traditional analogy of the genealogical tree also gives a misleading idea of the nature of organic succession. The usual object of a genealogical tree is to show descent from a single ancestor, and unless consanguineous marriages occur, all the branching lines of descent remain separate and distinct. But this apparent distinctness is maintained only because each marriage is a grafting with a branch of a different family tree. If all these genealogical trees with their intergrafted branches could be represented, we would have a diagram corresponding to the network of descent of the species.

That the network of descent is lacking in definite form or external morphological structure is not a reason for denying that the species has organization, for amoebae and many other living organisms lack definite form. This is true even of some highly specialized organs, such as the brain, whose functions are not at all dependent upon regularity of external form. Morphological specialization is, after all, only a secondary result of protoplasmic specialization. The conditions that determine protoplasmic efficiency must be recognized before we can hope to understand organization in the external, structural sense.

Some have thought to gain a better understanding of heredity by analyzing the diversified natural species into uniform pure lines, where the analogies of the physical sciences more nearly apply. Yet evolution is not an analytic process, but highly synthetic. The specific organization of interweaving lines of descent provides for the accumulation and combination of the desirable variations, those that render the species better adapted to its environment. To unravel the network of descent into separate lines may help us to understand some of the problems of heredity, but it does not represent the essential condition of normal, self-perpetuating organic existence, or of evolutionary progress. None of the analytic experiments in the propagation of single lines of descent are permanently successful. If the crossing of the lines of descent is prevented, as by vegetative propagation or by artificial breeding, the individual structures become abnormal or weak and eventually cease altogether. Our vegetative varieties and pure bred strains are short-lived. None of the higher types of plant or animal life are maintained without sexual reproduction in a specific network of descent.

THE NETWORK OF DESCENT.

To say that the power of organization is lodged in the individual germ cell is not the whole biological truth. The power resides rather in the specific organization, the protoplasmic network of the species, of which the individual germ is but a fragment. The vitality of the individual depends upon its relation to the organization of the species. The specific networks of descent, rather than the individual lines, have the power to develop and maintain the complex structures of the higher animals and plants. Organization in this sense of complex cellular structures is not a general property of protoplasm, for it is not manifested by the lowest forms of life, but is rather to be considered as an accomplishment of the higher forms, those that have developed complex specific organizations and correspondingly specialized sexual

[2]Cook, O. F. Physical Analogies of Biological Processes. The American Naturalist, 46: 493, 1912.

processes for maintaining the networks of descent of the species.

Why the interweaving of lines of descent in specific groups is necessary to maintain the power of cellular organization we do not know, but neither do we know why the overlapping of metal plates generates the electric current in a voltaic pile. The facts are established by repeated observation, and should not be disregarded in our attempts to understand related phenomena. Of course, these complexities of specific organization and sexuality are very unwelcome ideas to those who are about to solve the problems of evolution and heredity by simple experimental and statistical methods, but no truly biological investigation can disregard the fundamental fact that organisms exist in species.

That categories of classification of species are artificial is not an indication that the groups themselves have no real existence. As well might we say that continents and islands have no real existence because their shore-lines are not definitely fixed and do not coincide with parallels of latitude and longitude which geographers use to determine locations. The object of biological classification is to find our way about in the endless diversities of organic nature, and for this purpose many conventional devices are employed, but these should not be allowed to conceal the more essential facts.

FINDING THE LIMITS OF SPECIES.

Students of classification are always seeking diagnostic differences between the various species and higher groups, for the task of discovering such characters and framing them into words is very difficult. Hence taxonomy makes only gradual progress, like other departments of science. Yet the formal nature of the concepts and categories of classification does not affect the concrete nature of the groups that are being classified. The categories of the biologist are artificial like those of the geographer, but not more so. Geographers do not agree in the grouping of the archipelagoes of the Pacific Ocean, but this is not considered a reason for denying that islands exist or that some islands are close together and others far apart. Species are biological islands, in a sea of non-existence. The higher categories of classification, such as genera, families and orders, are more conceptual than species, in that they do not form coherent networks of lines of descent, but even this deficiency does not render them pure abstractions. They are to be considered rather as collective entities, that is, they are groups of species that stand in certain phylogenetic relations to each other, corresponding to the positional relations that determine geographic groups.

It is true that the boundaries of species often appear less definite in nature than in books, but the same is true of islands where the shore lines change with every tide, to say nothing of the more extensive and permanent changes by erosion of cliffs or elevation of beaches. Yet these incidental limitations need not destroy concrete ideas of islands as continuous bodies of land, nor of species as coherent groups of organisms. The members of each species are bound together by a network of lines interbreeding into a physiological unity, quite independent of morphological similarities or diversities inside the species. It is organization that constitutes the species, not the characters that may be ascribed to it.

The difficulties of classifying and discovering diagnostic characters for the several millions of species that exist on the earth's surface should not be allowed to confuse the minds of physiological and statistical workers, or to obscure the reality of specific organization. The specific structure or speciety of living matter is as truly a fact as any other biological phenomenon. That there should be so many species, and so difficult to classify, adds annoying complexities to biological investigation, but the difficulties are not removed by disregarding the existence of species. Sailors encounter similar difficulties in the navigation of archipelagoes, but do not find it safe to overlook any of the islands that lie in their courses.

COLLECTING IN TURKESTAN

Work of Botanical Explorer Hindered By Many Difficulties and Even Dangers—Wild Vegetation Scarce and Flora Not Rich—Native Fruits of Mediocre Quality But Extremely Hardy and Resistant to Drought and Alkali.[1]

FRANK N. MEYER,
Agricultural Explorer, Office of Foreign Seed and Plant Introduction, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C.

TASHKENT, TURKESTAN.

Aug. 20, 1910.

ALL this delay is, as you surely will feel with me, of very great annoyance and becomes really depressing. There are moments when the loneliness of this exploration work becomes too great and I would like to fly off to regions where I could find more intellectual and social surroundings. And I have such a long journey yet ahead of me. Great Scott! before I appear somewhere in Eastern China, I'll have gone through many a lonesome day! That's one of the troubles connected with exploration in out-of-the-way places; this loneliness and this great waste of valuable time and energy. Of course it could be worse yet. Polar expeditions are still way ahead of our work in waste of all sorts of things.

As I wrote you from Samarkand on July 4, 1910, I had engaged a guide and had had an interpreter already for a few days. We had seen the police about our trip and the chief had said everything was O. K., but in Pendshikent we would have to get a paper from the police there.

On Tuesday, July 5, we had negotiations with various horsemen and cartpeople and as we were assured that in Pendshikent we would be able to get cheaper and better horses, we went by a large cart to that last named city on the next day, where we arrived after a hard ride at ten o'clock in the evening of that same day.

A PLAGUE OF LOCUSTS.

On Thursday, July 7, we inspected the grain market and seed stores, where I bought some samples of various things and in the afternoon we had conferences with the police and with horse men. I got a paper from the acting chief of police and on Friday, July 8, we left Pendshikent. We travelled first through a dry, elevated plain, where scanty growth of wheat, barley, linseed and rape was to be seen, while tens of thousands of locusts were devouring whatever they could find. In the afternoon we went through some gullies and passes and then mountain climbing had begun. On a few places we saw some beautiful Eremurus and yellow larkspurs, but in general the mountains were devoid of vegetation, save some Astragalus and a *Capparis spinosa* and some Artemisias. At 9 P. M. we stopped at last in a town called Stood, about 5,000 feet above sea level. We slept on the porch of the Muhammadan temple and got but little

[1]The story of Mr. Meyer's entry to Turkestan was told in the March issue of The Journal of Heredity; the continuation of it, as told in letters to his chief, is given herewith. The accompanying photographs are all by Mr. Meyer: the scientific names are in the form used by him, and not necessarily in the form adopted by the department, when the material was distributed to plant breeders in the United States. Mr. Meyer's exploration of Turkestan resulted, as most plant breeders know, in the introduction to the United States of many tons of material, including hundreds of species of plants suited to desert climates, which are being tested in the southwestern United States. His collection of alfalfas was perhaps the most valuable single contribution. Mr. Meyer is now engaged in a three-year exploration of eastern China, where he has already made important discoveries of chestnuts, jujubes and persimmons.—THE EDITOR.

THE VALUABLE KARAGATCH TREE.

This dense-headed, desert shade tree (*Ulmus campestris umbraculifera*) is found throughout Russian and Chinese Turkestan, although the forms in the two countries are distinct, according to Meyer. The photograph shows a particularly beautiful specimen at Orono, in the province of Samarkand, Russian Turkestan, July 13, 1910. It has been introduced to the United States, and promises to be extremely valuable in the arid Southwest. (Figure 4.)

supper that night, it being too late to find anything.

On Saturday, July 9, I went around for several hours in the mountains, collecting seeds and herbarium material and at noon we left with our little caravan of six horses and six men (interpreter, guide, three horsemen and myself). We passed through a wild, mountain valley, where a roaring torrent was still eating out its bed deeper and deeper; after having scaled a dangerous, dry mountain, we arrived at sunset at a beautiful but cold lake at 10,000 feet altitude; this lake is called Kalikulan and is fed from the eternal snows on the mountains around. The water was so cold that one wouldn't readily bathe in it, and as for drinking, one could only take a mouthful at the time. The soil in these high regions is sterile and the growing season very short, for the snow melts away in early May and returns again at the beginning of September. Still one finds there masses of Junipers (*Juniperus foetidissima*), Barberries, bush honeysuckles (*Lonicera sp.*), yellow roses (*Rosa xanthina*), a mountain ash (*Sorbus thianshanica*), besides various herbaceous plants like *Eremurus sp.*, *Gentiana verna*, Leonurus (?), several Compositae, etc. We were lucky enough to find at the lake an encampment of a local Sart administrator and slept that night in a tent made of carpets, but still it was cold, after coming in two days from the hot plains.

SCARCITY OF FOOD.

On Sunday, July 10, we left our lovely, silent sheet of water and climbed over one high and difficult mountain, where

NATIVE PLUM IN FULL BLOOM.

Russian Asia is rich in native plums, some of which are valuable commercially, while others are promising only as hardy stocks for grafting. *Prunus insititia*, shown in this picture, is locally known as the alutcha, and is said to be extraordinarily prolific, as well as a regular bearer. Some of the species are quite ornamental. Meyer mentions one found along a watercourse in the mountains near Kulikalan, Samarkand, Turkestan, at an elevation of 6,000 feet, which had light green leaves and bore long racemes of small, oval, scarlet fruits of a bitter-sweet taste. It and many other species are now growing in the United States, as a result of his exploration. (Figure 5.)

the descent was at times even dangerous and, horses and men all being tired, we camped at 4 P. M. on a grassy, level place, near a stream, and had a great time in getting enough to eat, for there are very few people in this elevated region of Central Asia and food is scarce and at times altogether unobtainable. We got, however, sour milk and pea-flour bread and, with some conserved sausages which we had still with us, we made a meal of it. The interpreter could not stand the rarefied mountain air; he had heavy hemorrhages from the nose twice a day and felt quite weak. The guide, who was addicted to strong drink, could not get anything, of course, and had become very sullen, so you may imagine that I was not in a sociable company.

Well, on Monday, July 11, we passed through wild, rocky scenery, going along precipices where the horses had to be held by two men, one at the head and one at the tail, so as to prevent accidents. In the afternoon, about five o'clock, while collecting wild cherries on the mountain slope, we came all of a sudden upon a caravan, consisting of 20 people and still more horses. It proved to be the civil-administrator of the district, accompanied by the chief of police of Pendshikent, an interpreter, local chiefs of villages, guards, scouts, etc.

Our meeting was somewhat remarkable, as few white men ever travel in these regions.

The first thing we were asked for was, of course, our passports. The administrator (a Russian police-officer of high rank) said that my papers were not as they ought to be, as they were not defi-

SPIRAEA HYPERICIFOLIA.

One of the most ornamental wild shrubs of Asiatic Russia, found from the Caucasus region and Persia eastward to Mongolia and the region of Lake Baikal. It is able to stand great heat and drought and is therefore recommended as an ornamental park and garden shrub in the more arid sections of the United States. The above photograph was taken on a hillside near Tiflis, Caucasus, Russia, April 24, 1910. (Figure 6.)

nite enough, but I told him I had received them so from the acting chief of police in Pendshikent. Well, he let us go on. Half an hour later, however, a messenger came to us, informing us that we had to return, as the administrator did not feel he could let us go on any further. The acting chief of police in Pendshikent had made a failure of the document that he gave me, having forgotten to mention the exact date and number of my permission from St. Petersburg and he (the civil administrator), being held responsible for the district I was travelling in, could, under those circumstances, not allow me to go on any further.

RETURN NECESSARY.

He said he would allow me to stay there in this village, until a messenger had arrived from Samarkand, as he would investigate this affair; if things were found to be O. K., I could proceed farther on; if not, I would have to return under guard. I had a short conference with my men and then told this administrator that as it might take a messenger to and from Samarkand from five to ten or even twelve days before I could have been cleared of his suspicions, and as my caravan alone cost me from fifteen to twenty roubles a day, I had to decline his offer, but wanted to return by another road to Samarkand

THE PARADISE APPLE AT HOME.

This bushy apple (*Malus paradisiaca*), apparently a native of the Caucasus, is now widely grown all over the world as a grafting stock for dwarfing apples. Mr. Meyer believes it has still a useful future before it as a factor in producing a strain of bush apples suited especially to regions where the summer temperatures are too high for ordinary apples. Photograph made at Geok-Tapa, Caucasus, Russia, April 11, 1910. (Figure 7.)

and investigate this matter myself and find out who was responsible for this mishap. Well, he was kind enough to allow this and as I promised him I would not escape, I didn't even get any guard sent with me.

And so we left that village of Peki on Tuesday, July 12, 1910, went for the whole day along an extremely bad road where often the path went simply over sticks and poles, put slantingly in the rocks and covered over with brush and dirt. We wound along the roaring Zarafshan river, sometimes level with the water, then again several hundred feet above it. Tales of accidents had made us apprehensive of the great dangers of this road, but, thank Heaven, nothing occurred save that the baggage looked less respectable in the evening than it had done at the outset. We had to employ three porters at the most dangerous points to carry the more valuable baggage, for it was too unsafe to allow it to remain on the packhorses' backs, especially my satchel, in which all passports and valuable papers are stored. If, for instance, my letter of credit, together with the passports, had gotten down in the deep, I could almost as well have shot myself, the more so as 1,000 roubles in paper money was also among its contents. It is my policy to have all my valuable belongings in only one receptacle, which has to be strong, not to be too heavy to be carried easily

by one person, but also not to be so light that one can easily run away with it; and this piece of baggage always has to be taken care of the very first thing and is always at night at my own head. Well, we passed this road, which is one of the worst I have seen in my life, safe and sound, and slept that night beneath old apricot trees in the court of a local dignitary in the prosperous town of Orono, situated in the rich valley of the Zarafshan.

WILD VEGETATION SCARCE.

On Wednesday, July 13, we followed the Zarafshan the whole day and passed several villages, where orchards of apricots, mulberries and walnuts intermingled. Wild vegetation, however, is almost absent. In a naturally dry climate, the long occupation of men has exterminated what little there formerly grew upon the mountain slopes and in the glens and today everything is scorched and barren.

On Thursday, July 14, we left the town of Langar, where we had stopped for the night, and passed through a region where almost no level spot was found at all; everywhere mountains and precipices, all rock and cliffs. As a result no villages have been established, and as distances are too long for peasants to carry away woody vegetation to their homes, we found lots of interesting plants: Pistaches, almonds in three species, *Prunus divaricata*, maples, junipers, coluteas, etc. In the herbarium material I sent off a few weeks ago, you'll find many labels bearing the date July 14, 1910. As I had to do all the collecting myself, my men not being intelligent enough for it, I was rather tired that day and was glad to sleep again on the porch of a Muhammadan mosque, notwithstanding a strong wind blew all night through the tall walnut trees and made one dream of storms at sea and fights in forests.

Friday, July 15, saw us leave Wishist, and late in the afternoon we came back again in Pendshikent, where our early return caused lots of surprise, since we had said we would stay out at least one month. And now we went to the police again and found out my name had been booked, but that the acting chief of police was at fault. Then the horsemen to whom I had paid 100 roubles in advance, besides having lent them money on the road, wouldn't return the money and we had to ask the assistance of the police and a judge to get most of it back; even at that I lost twelve roubles on the transaction, besides finding it an extremely unpleasant business which lasted all through Friday evening and Saturday, July 16. The guide, to whom I had given some money, too, got dead drunk and made troubles worse. Yes, this whole trip was tragi-comical! It is good that I am sufficiently hardened off to stand a wee bit of trouble, otherwise such matters are able to make one lose temper and sense.

SECOND DEPARTURE.

On Sunday, July 17, we left Pendshikent again by cart and after a long day's ride we arrived in Samarkand at nine p. m.

On Tuesday next I went to the governor of Samarkand and complained verbally about this treatment I had experienced at the hands of his subordinates. He was a very kind man, had investigations made straightway, and in less than an hour I had a paper in my possession giving me full rights to travel in the same district from which I had been chased out. The very administrator who had been so suspicious, was smiles all over, and pointed out places on the map where many plants were found, and even offered to collect material. And there the matter rests.

When in Samarkand, my interpreter in the meantime had found out that certain things had been taken from his dwelling, while he was absent, and he made this as an excuse for not being willing to go any longer with me, although I knew that it was the hardships and the want of the "flesh pots of Egypt" that made him stay back. He promised, however, to accompany me to Tashkent and find me another interpreter, but after having had private troubles at home, he did not want to do that either, and left me wholly alone. Now I could have gone to the police and forced him to stay with me, as I had a witness that I had engaged him for at

DESERT POPLAR OF TURKESTAN.

A species (*Populus pruinosa*) which is widespread and extremely hardy in Turkestan. It is mixed with tamarisks, which are the low shrubs in the photograph. It also grows widely side by side with *Populus euphratica*, which it considerably resembles. It is one of the most recommended drought-resistant trees for arid regions with scorching summers and mild winters; needs almost no water; but is, unfortunately, difficult to propagate. The wood is hard and durable. (Figure 8.)

least one month, but I had in mind an old Dutch saying: "Mit onwillige honden is't slecht hazen vangen" ('tis a bad job catching hares with unwilling dogs), and in my work especially, if people don't put a little sympathy into it, one gets almost nothing accomplished at all.

AT THE RAILWAY TERMINUS.

ANDISHAN, TURKESTAN, RUSSIA,

Oct. 4, 1910.

As you see, I am now at the terminus of the Central Asian Railway, and will write you from here a short report of what passed over our heads these last weeks. We changed our plans and instead of going alone on Monday, with a Chinese interpreter, and taking the train, we hired a wagon and went on Tuesday, September 20, 1910. The reasons for going by wagon were many. Firstly, I have an awful amount of baggage (close upon 1,200 lbs.), which is very inconvenient to ship by rail, the more so as some of it is not accepted by the railroad unless crated, and that is too much work; secondly, my interpreter is a new man, whom I know only slightly, and there is no better chance of learning a fellow's characteristics than by subjecting him to a roughing trip; for the Chinese interpreter it was also not bad to learn how to travel in Russian Turkestan. Then in addition came the fact that I could study the country better by cart than from a train window, and last, not least, my health hadn't been of the best in Tashkent, and such a cart trip would make me all right again.

Well, all things went as well as they could. In three days' time we covered the distance from Tashkent to Khodjent, passed through rice fields, fruit gardens, deserts, etc. It is exceedingly difficult, however, to inspect fruit or vegetable gardens close by, as all the plantations are surrounded with high mud walls and strangers are not admitted. Then we also had difficulties in obtaining sufficient food in daytime, as Ramadhan, the Muhammadan month of fasting, was in progress. This incomprehensible religious feast allows no Mussulman to partake of food and drink as long as the sun is in the skies. As soon, however, as that body sinks down, then eating and drinking commences and merriment is made until the break of day. The main meal is eaten then between eleven p. m. and one a. m. What use this unhealthy rule has is as yet a puzzle to me, but this is certain, that it is most inconvenient to all travellers and even to the believers themselves. We often couldn't get a cup of tea, even in daytime, and ready food was quite out of the question.

PEACHES UNDISCOVERABLE.

On Friday, September 23, we stayed in Khodjent and wanted to find some famous peach varieties. We were, however, unable to find anybody willing or capable to show us around, and it was a Muhammadan holiday besides, so we had to give it up. Our wagon driver had become dissatisfied with the expensiveness of feed for his horses and wanted an extraordinary price before he would go any further, although we had engaged him for at least as far as Kokand. Well, we wouldn't give in, and engaged two local two-wheeled carts and left the next morning, September 24. On Monday, September 26, we landed at sunset in Kokand and had our first clean-up in seven days. The last three days we had passed most of the time through sandy, stony and alkaline deserts, going sometimes axle deep in dust, so we and the baggage were simply covered with gray and brown coats of desert dust. At the Russian hotels we tried to find accommodation; they were suspicious of us and we had some trouble of getting a roof above our heads. We had to give our passports the very first thing, apparently to satisfy the fear that we were robbers, returning with loot!

In Kokand we stayed two days, inspected bazar, seed and grain market and looked over the fruits. Kokand is reputed to be the finest market in Central Asia, and I really expected to find many new things. There is, however, not as much in our line as one might wish to see. I got some samples of unusual varieties of almonds and a large brown chickpea which I had not seen before. There were also very fine speci-

WILD DESERT PEONY.

Unidentified species having medium large, carmine flowers and glossy, gracefully cut foliage of a dark green color; found growing on rather stony and sterile places in Turkestan. Sent to the United States by Meyer as a spring flowering plant for gardens and parks in the northern United States. (Figure 9.)

mens of pomegranates to be seen; that is, of fine color and size, but of very sour taste. Of grapes, the beautiful rosy-white *Ghusaine* table grape was very fine with its long, translucent berries, which taste remarkably sweet.

In the immediate neighborhood of Kokand one sees field after field covered with cotton, alternated with alfalfa and "jugara." This last can stand considerable alkali and may be of some value in alkaline regions with long and hot summers. One also notes the masses of Oleaster trees that are everywhere around the fields and along watercourses. These Eleagnus trees exhibit a remarkable variation in general habitus, productivity and sizes of fruits. The bigger part of them all seem to be seedlings, and are planted apparently only as shelter material; at least the fruits of many are too astringent to be edible, and even of the larger fruited forms, only here and there are the fruits collected. It is, however, a beautiful tree in the landscape, especially the silvery-white forms with the narrow, long leaves.

CHOLERA ENCOUNTERED.

On Thursday, September 29, we left Kokand by train, after having packed our baggage so that the railroad could accept it. In the afternoon we arrived in Margelan, a town where the governor of the Ferghana Province resides. (The name Margelan was changed last year into that of Skobelevo, but men persist yet in calling it by the old name, although the native city of Margelan, where only Sart people live, still retains its old name.)

We left Margelan in the afternoon of October 1, and arrived at evening in Andishan, where I have been writing these last days. We saw the police, of course, or rather were requested to come, and as *my* papers are in good shape, the German interpreter is allowed for the present to stay too, but we had to whisk our Chinaman away to some native inn, where he keeps company with a few fellow countrymen and eats with them. There is much cholera here in this place, and we are very careful with our food. Yesterday I believe

AN ORNAMENTAL EREMURUS.

Unidentified species from Kulikalan, province of Samarkand, Russian Turkestan. Its spikes of rosy pink flowers often reach a height of four feet. The plant is found at an altitude of 7,000 feet in rich, black soil, and is able to stand both drought and cold. (Figure 10.)

seventeen people died here from this dreadful disease, but in fact there may die many more, for the fanatical Muhammadan population persists in hiding cases of sickness and drinks water from polluted places as if there were not such things as bacilli. The summer lasts very long here. All the trees are still in full leaf, and where some have fallen, it is not from cold, but from drought. I hope we'll soon get a cold spell, so that I can send some scions and cuttings of various things.

My present interpreter is not a genius, but I'll see how we can plod along. Turkestan certainly is an extremely difficult country to move about in; the moment one leaves the railroad questions are being asked, and for every little excursion special permits are necessary. I wouldn't advise any one to select this land for a holiday trip, and I have to restrain myself not to leave this whole territory as it is and live somewhere in more peaceful surroundings.

Well, one or two more days and I'll leave by cart for Osh, from there by packhorses to Kashgar. Some robbers are reported to be on the road, and they murdered some people here these last two nights, but a botanical collector is generally exempted from those annoyances.

New Publications

PRODUCTIVE HORSE HUSBANDRY, by Carl W. Gay. Philadelphia and London, J. B. Lippincott & Company, 1914. Pp. xv. + 331, $1.50.

Professor Gay of the University of Pennsylvania states that his purpose in writing this volume was "to emphasize *industry* as applied to horses." His treatment of the principles of breeding is, therefore, summary and wholly practical. The book should be of value to anyone taking up horse breeding as a business.

THE CULTURE OF BLACK AND SILVER FOXES, by R. B. and L. V. Croft. Woodstock, the Rod and Gun Press, 1913. Pp. 83, 60 cents.

This is the latest handbook produced by the amazingly rapid development of silver fox breeding on Prince Edward Island, and is destined for those taking up the work as a money-making proposition. Hence it is primarily of practical nature, but the authors have inserted a considerable amount of theoretical discussion of heredity. They consider the silver fox the product of variation and isolation, not of hybridization, and declare that the coat color is never blended in inheritance, but either "particulate" or "exclusive." Their data, however, show that many factors must be concerned, and they admit that no systematic experiments have been undertaken to discover the ancestry of the present valuable breeds of foxes.

The Immigration Problem

We have an opportunity which is unique in history for the practice of eugenic principles, immediately and on a vastly greater scale than is possible in the case of any other nation. By selecting our immigrants, through proper legislation, we can pick out the best specimens of each race to be our fellow-citizens, and to be the parents of our future citizens. The responsibility which rests upon us in this matter is overwhelming.—Robert DeC. Ward: The Crisis in our Immigration Policy (Inst. Quart. Ill., IV, 2, 1913).

BREEDING KARAKUL SHEEP

Industry Only Six Years Old in the United States, but Attracting Much Interest—Difficulties of Securing Stock—Six Classes of Karakul Recognized in Asia, All Owing Their Origin and Color to the Small, Black Danadar, Now Almost Extinct.

DR. C. C. YOUNG,
Belen, Texas.

THE Karakul sheep industry is one of the most recent enterprises in live stock in the United States, but few branches of this department of breeding are attracting more attention today. I propose, therefore, to give in this paper a history of the introduction of Karakul sheep into North America, an account of the present status of the industry, and my belief as to the origin of the six classes which, in Central Asia, are recognized as making up the breeds known to the Russians as Karakul and to the Bokharans as Arabi.

The industry in the United States dates back only to 1908, when a letter of introduction from President Roosevelt to the United States Ambassador at St. Petersburg enabled me to interest his excellency A. S. Yermaloff, ex-minister of agriculture of the Russian empire, and now a life member of his majesty's council. Through his influence I secured the cooperation of the Poltava Agricultural Society, which obtained for me fifteen head of Karakuls in Bokhara.[1]

The laws of the Khanate of Bokhara prohibit the exportation of these valuable fur bearing animals by foreigners, but a few flocks have been gotten out by certain Russian societies, who have received the support of the Russian Foreign and Agricultural Departments. Although Bokhara is a quasi-dependency of Russia, the czar does not interfere in the international administration of the emir's empire, which has an absolute monopoly of the Persian lamb and Astrakhan fur industry.

The Russian government also prohibits the importation of Karakul sheep, and as the United States government generally does not permit the importation of live stock from Asia we have found it an almost impossible task to start the industry on this continent, although our efforts extend over a period of fifteen years.

THE FIRST IMPORTATION.

In the beginning of 1909, five rams and ten ewes arrived in New York on a Saturday boat, which was scheduled to return on Monday, and had it not been for the prompt intercession of the Hon. J. A. Tawney, whom we happened to reach at the last moment, and who secured the cooperation of the federal authorities at Washington, my Karakuls would have been slaughtered or returned on the same boat.

The sheep were in quarantine for a long time, and for three months were kept in an absolutely dark barn, in order to lower their power of resistance, and to make it possible to trace in the blood the parasite of surra. When flash light photographs reached us, showing the animals to be in a very emaciated condition, we at once applied to Mr. Roosevelt, who ordered their release.

I returned in May last from a year's

[1]Those interested may refer to the American Breeders' Magazine (third quarter, 1912), Literary Digest (September 30, 1911), and the New York Herald (September 10, 1911 and April 20, 1913) for further details about my importations.

A FULL-BLOOD KARAKUL RAM.

Teddy junior, shown above, is a son of Teddy senior, the famous ram of Dr. Young's first importation, who, after being kept at Wichita Falls and Middlewater, Texas, is now at Prince Edward Island. Teddy junior died at the United States Department of Agriculture's experimental farm near Washington, D. C., last year, when accidentally kicked by a zebra. (Figure 11.)

trip to Central Asia, and succeeded in bringing with me another herd consisting of seventeen Karakul sheep, one four-horned, fur-bearing Karachaev ram, and one enormous red Kalmik fat-rump ram. The quarantine regulations were less rigidly enforced, but the dipping of the sheep in cold weather cost me the life of the best ram of the lot.

When the sheep of my first importation finally reached our ranch, near Wichita Falls, Texas, we noticed that the fourteen accompanying lambs which were born in transit did not have the expected lustre and tightness of curl, the only exception being two of them, which fully measured up to our expectations.

My father, who has been raising Bessarabian Tshushkas (grade Karakuls) near the Black Sea for a great many years, and who criticised me severely for risking thousands of dollars on a few sheep, remarked that I had probably thrown my money away, as in his opinion the climatic conditions of Bokhara were essential to the best lamb fur raising.

As the two ewes that produced the best lambs seemed in a little better physical condition than the rest, we concluded that in another year when all the sheep would be in better physical condition, the result would probably be more satisfactory.

During the entire year the sheep were well fed, and in the summer months they enjoyed the best of pasture,

but when spring came, notwithstanding the fact that the ewes had been bred to the ram which seemed in the best physical condition, the lambs did not show the improvement from a fur standpoint which we expected, except those lambs which came from the two ewes that the previous year gave us two good lambs.

FLEECES DETERIORATE.

A careful examination of the curls of the lambs of the two good ewes showed, however, that there was less lustre than the year before, and less tightness of curls, and my father remarked that we would probably find that the same Karakul sheep which gave us excellent result in Bokhara would fail us in Texas, where the climatic conditions were different, especially as far as rainfall is concerned.

The third year showed considerable improvement, especially with the two good ewes, which gave excellent results. We then began to study the original five rams and noticed that the character of the wool was not the same, and that Teddy, named in honor of Roosevelt, and another ram had coarse long wool, whereas the others had two classes of wool fibers—a long coarse gray wool, in which was hidden a fine lustreless short reddish wool resembling microscopically that of our Merinos. To our great surprise we found that the two good ewes also were free from the fine underwool. The next year, we satisfied ourselves absolutely that the fine wool present in most of the sheep was entirely responsible for their inferior fur-producing qualities. We named sheep which contained this fine wool "Karakul Finewools" but later, when we found that this fine wool came into the strain through the admixture of some fine-wool-bearing Afghans, we changed the name to "Karakul-Afghan."

It was quite by accident that I found out that by breeding Teddy to the Karakul ewes fairly good results were obtained, especially from those ewes that had less fine wool in them; and in one case a Karakul-Afghan ewe that had but little fine underwool, which was bred to a son of Teddy, himself not entirely free from fine wool, gave us a fair lamb, which was exhibited in Omaha in 1911 by Joseph F. Simonson.

A number of other tests finally convinced me that a very small amount of fine wool can be overcome, and considerable fine wool in ewes can be neutralized, where the ram is entirely free from the short fine underwool. Two crosses suffice to breed it out entirely.

DIFFERENCE IN CROSSES.

Where we crossed Merinos and Shropshires with Teddy, a very inferior skin was produced,[2] in which there was great lack of lustre, and a very imperfect curl formation, giving the skin a matty appearance, valueless from a fur standpoint, but excellent results were obtained when the same ram was bred to such of our lustrous longwools as Lincolns, and such red Persian fat-rumps as were entirely free from short wool, and possessed very coarse wool.

Where Teddy was bred to longwool ewes, free from fine wool, and the skins of the lambs were obtained the first few days after birth, they showed tight curls uniform in size and posesssing the required lustre. Such half-blood skins were valued by Pretorius and Thorer, assisted by Henry Basch of New York, to whom we were referred by the Department of Agriculture, at from $8 to $12 per skin. In all cases where the prices ranged from $3 to $4 the skins showed lack of lustre and curl formation, which was easily traced to fine wool, either in the Karakul rams or grade native longwools. The Middlewater Cattle Company, which purchased all the so-called Persian sheep of Col. Charles Goodnight, found that these were valueless, except where the ewes were free from fine underwool, and only where Teddy was employed were the results satisfactory—in fact, most of the $12 skins were halfblood Karakul-Persians.

The red Persian fatrump, erroneously called broadtail, and sometimes fattail,

[2]The second cross is greatly improved.

THE CURLIEST LAMB BORN.

Full-blood Karakul lamb four days old. The father is Teddy senior, the property of the Middlewater Cattle Company; the mother is a full-blood Karakul ewe, but has some fine wool in her fleece. Little of this is evident in the lamb, however, bearing out Dr. Young's contention that a small amount of fine wool in the ewe can be neutralized by a prepotent, decidedly coarse-wool ram. Note the tight curls of the lamb, extending from the tip of its nose to the end of each extremity. Photograph furnished by Joseph Simonson. (Figure 12.)

is a very hardy mutton sheep, belonging to the species of *Ovis steatopyga*, and is closely related to the Kalmik, Mongol, Khirghiz, Tshuntuk and other fat-rump (Kurdiuk)[3] breeds, that have very coarse, brittle, generally red wool but possess no fur characteristics whatsoever, unless they are crossed at least once with Karakul rams of the right class. The furriers, who in their ignorance call Karakul skins (either full-bloods or grades) "Persians," "Persian Baby Lamb," "Persian Broadtail," or "Astrakhan," furnish the opportunity for certain breeders of red Persian fat-rump sheep to dispose of their stock as "Persian broadtails, the only genuine fur-bearing sheep that produce the famous Persian and Astrakhan furs." To corroborate these statements readers may consult a book on Russian breeds of sheep, issued by the Russian Imperial Department of Agriculture, also a circular recently issued by the United States Department of Agriculture.

From the two good ewes and Teddy there were born three rams, one of which was used one season by the United States Department of Agriculture on the experimental farm near Washington, D. C., and there lost his life from the kick of a zebra. Another good ram died on a ranch in Texas, from eating green alfalfa. The third ram became the property of the Middlewater Cattle Company, controlled by former Congressman Frank O. Louden of Illinois, and was finally bought back from them by ourselves, and is now on Prince Edward Island, where we have decided to establish our Karakul industry. The fourth ram, a grandchild of Teddy, was sold by us to the University of Edinburgh, but has not yet been delivered.

KARAKULS IN AMERICA.

The father and grandfather of these four rams—Teddy, Sr., the only good ram of the first importation—is the property of the Middlewater Cattle Company, of Middlewater, Texas. The second coarse-wool ram of the first importation, when crossed to good Lincoln ewes, gave fair results, and is today our property on Prince Edward Island

About three years ago, the entire herd, with the exception of three Karakul fine-wools that were purchased by R. J. Rhome, of Texas, was divided equally between the Middlewater Cattle Company and myself, but I have since sold my share, telling the purchasers of the urgent need of breeding out the obnoxious fine wool strain by the introduction of new Karakul coarse-wool blood of the second importation which landed in Baltimore in March, 1913, before offering any for sale. My advice, however, was disregarded. I strongly urge breeders to be cautious in buying rams. The officials of the U. S. Department of Agriculture at Washington seem fully alive to this danger, and in a recent circular letter advise the purchase of tested rams only.

Out of the second importation, six rams and four ewes were purchased by the Hon. Charles de Bremond of New Mexico, I retaining an undivided half interest in them; the balance are the property of the writer and his associates in Charlottestown, P. E. I., Canada. where black silver foxes and other fur-bearing animals are raised with wonderful success.

We find in Central Asia six classes of Karakul[4] sheep, all of which owe their black pigment, tendency to tight curl formation, and lustre, to the small, black, and nearly extinct D inadar sheep. These breeds are known as (1) Large Arabi or Duzbai, (2) Small Arabi, (3) Intermediate Arabi, resulting from the crossing of the above mentioned three classes, (4) Gray Shiraz, (5) Zigais (of these classes there are very few), (6) Karakul Afghans, which last class unfortunately comprise 90% of all the fur-producing sheep in Bokhara, and while possessing excellent mutton qualities and wonderful hardiness, like all of the other breeds, can hardly produce profitable fur in America, where people

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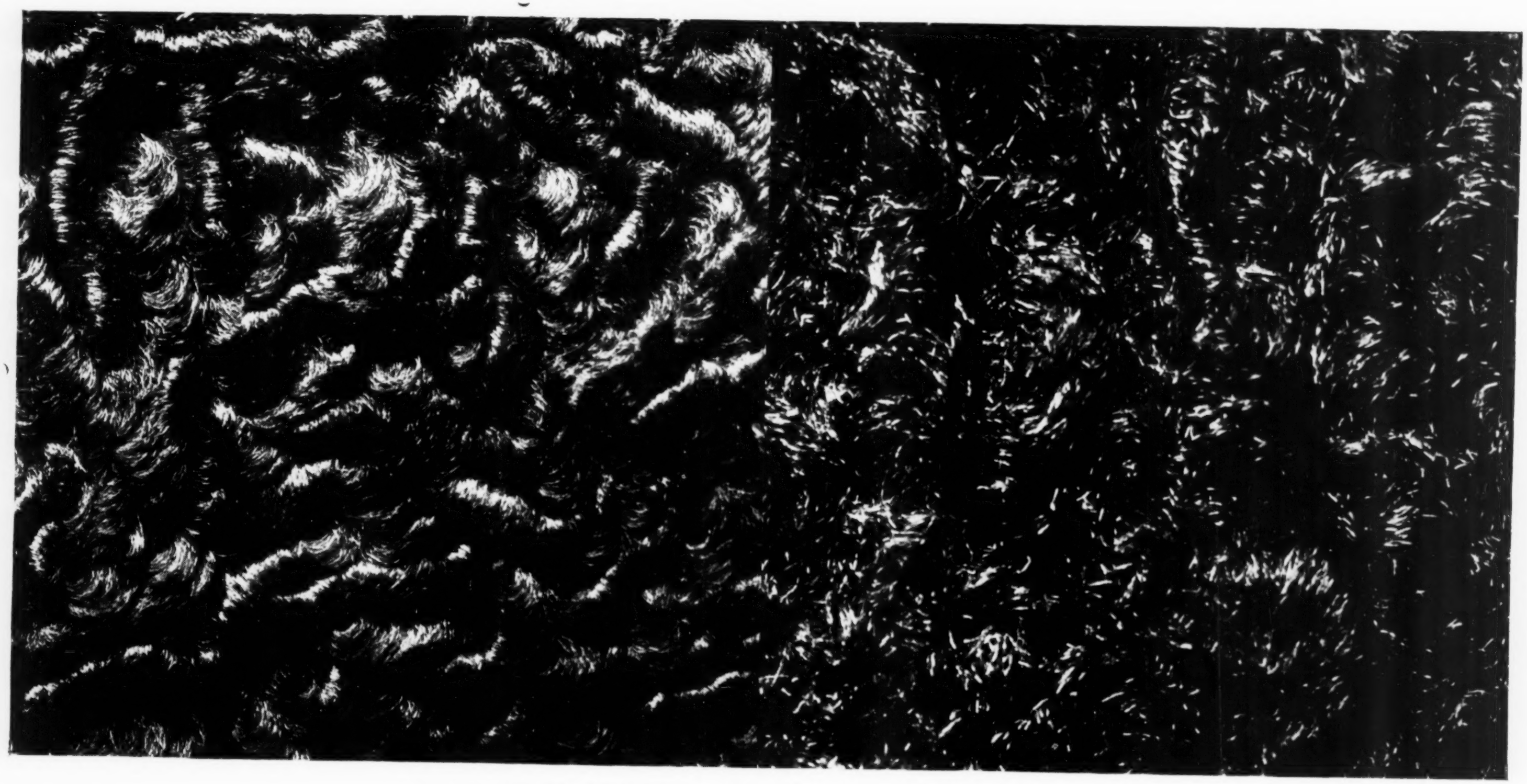
[3]Kurdiuk is the Tartar word for "fat rump."

[4]Kara Kul, "Black Lake," is the name of a town in Turkestan, where these sheep have long been raised. It has given its name to the whole breed, through its adoption by the Russians.



A STUDY IN HEREDITY FOR FUR-LAMB PRODUCERS.

At the left is a section of the skin of a half-blood Karakul lamb a few days after birth. Its sire was the full-blood Karakul Teddy, the only first-class ram in the first importation; its mother was a Lincoln ewe. Note the close, tight curls, and the lustre of the hair—on these two points depends the trade value of the skin. This particular specimen was valued at $12 by trade buyers in New York. At the right is the skin of another half-blood Karakul lamb four days old; its father was also Teddy, but its mother a Merino. The fine wool introduced by the Merino ewe has ruined the curl formation and lustre of the skin, making it practically worthless. From these two skins of lambs, both from the same father, it is easy to decide that a long-wool is superior to a fine-wool in crosses with Karakuls for fur production. (Figure 13.)

demand the best quality of the Persian furs, unless, as already explained, the rams belonging to this class are eliminated and the substitutes which give us the best results are chosen from the first mentioned three classes, thus enabling us to breed out the obnoxious fine-wool strain, if it exists.

Karakul-Afghan rams bred to English longwools give us a better fur than when crossed with Karakul-Afghan ewes—in any event the dullness is in a large degree overcome—but unfortunately, the curls are not tight enough, and there is also a lack of uniformity in the size of the curls. The average price of these skins is $3.50.

The following are the physical characteristics of the Duzbai Karakul: A large animal, the size of our Lincolns and even larger; large head, with very convex nose line; long, drooping, pendulous ears; some have large horns, others have none; strong, thick feet; immense broad tail, consisting of some eighteen vertebrae. At maturity it has coarse, long, gray wool on body, with coarse, stiff hair, that remains black even after maturity and with absence of fine under wool on head, face, feet and abdomen. At birth the lamb has, for about two weeks, beautiful, lustrous, black curls. It is this breed that the Russian Government bulletin, issued recently by Karpoff, mentions most prominently, speaking of our work in connection with it.

THE SMALL ARABI.

The physical characteristics of the small Arabi are: It is much smaller than the Duzbai, has thin feet, small head, straight nose line, short erect ears, long, slender, triangular tail, coarse, long, gray wool at maturity, with absence of fine underwool. At birth lambs come with beautiful, tight, black curls. Occasionally one of these animals remains black, even after maturity, and this led me to the discovery of the origin of all the Karakul breeds, which is the black, lustrous Danadar,[5] a few of which are still found in Khiva, Bokhara and Thibet, according to native report which I question.

Sometimes the coarse, hair-like wool, is as fine as that of our Lincolns and has great lustre, but when it lacks lustre it may be easily mistaken for Afghan short, fine wool. The difference in the length, however, always tells the story. So does the microscope. At birth the lambs come with very tight and lustrous curls.

The intermediate class is, as its name suggests, a mixture of the characteristics of the Duzbai and Small Arabi. As already mentioned, the Small Arabi is the best of these classes; but as the Duzbai is also highly satisfactory, and when bred to our native sheep gives an increase in weight and greatly improves the mutton qualities, as is shown in Armour's test, it is probably advisable to choose from these animals.

In selecting breeding animals, the essential thing is to avoid those with short, fine wool, that can be seen at a glance. The coarse, gray, long wool sticks out, and hidden in it is the short, lustreless, fine-wool, from the Afghan sheep, which I believe is the ancestor of the Merino. Generally the fine wool shows on the head, face and abdomen, and is without lustre, and brown, instead of black.

The few flocks that have been gotten

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[5]That the Karakul breeds have not descended from the Small Arabi, as certain Russian investigators state, I am absolutely sure. It was my good luck to find in England a furrier who sold the last Danadar skin 47 years ago, at which time there were no Persian Lamb, Astrakhan or Krimmer furs in the trade. F. N. Petrov, dragoman of the Russian embassy at Bokhara City, secured for me a gray Danadar skin (produced by a cross between the original black Danadar and the white Afghan fine-wool) and also sent me a photograph, made by him north of Bokhara City near the border of the Khanate of Khiva, and an examination of this skin and photograph will, I believe, convince anyone that my theory of the origin of the Karakul from the black Danadar is correct. Mr. Petrov also sent me a photograph of a supposed black Danadar at the present day; it does not convince me, however, that such an animal still exists. The tail of the sheep photographed, although not typically broad, is not long, as it should be, while the curls of the wool are excessively tight, resembling those of the Small Arabi. On my trip to Turkestan this summer I hope definitely to settle the interesting question of whether the black Danadar yet exists as a breed.

out of Bokhara in the past few years were, without exception, taken from settlements near the railway stations of Tjardjui, Kara-Kul and Bokhara City, where the chances of inbreeding are great. Practically all of the Karakuls were gotten out by representatives of Russian agricultural societies, to whom it did not seem to matter how many good, unrelated animals they could get for the meagre sum advanced them, but what number they could bring back in total, good, bad or indifferent, no matter whether inbred or not. Their chief anxiety seemed to be to avoid the reproaches of their fellow members, each of whom wanted some sheep; and unfortunately, these fellow members, although much nearer to Bokhara than our breeders, have nevertheless, just about as hazy an idea of the expense and difficulties to be overcome in the Kara-Kum desert as the average American sheep raiser of our Eastern states has.

DIFFICULTIES OF TRAVEL.

It is one thing to buy a few sheep in the oases close to the railroad, where one does not have to carry water, and quite another when it comes to fitting up a costly caravan and undertaking trips into the interior for hundreds of miles, carrying numberless burdiuks (water sacks), provisions, ammunition, bedding, utensils, and employing rather expensive subordinate officials, who can make a native sell one the sheep he desires, *providing one is fortunate enough to know a good Karakul when he sees one.* I have seen practically every sheep that has been gotten out of Bokhara into European Russia, and the good animals represent a negligible quantity indeed. When I was asked to separate the largest herd in European Russia, numbering nearly three thousand, I found 112 head among them that were more or less free from fine wool; but they were too closely inbred, which makes the wool fibre very fine, resulting in a cheap, open-curled, instead of tight-curled, high-priced skin. From this, it must be evident that European Russia at present is hardly the proper place to buy unrelated breeding animals, and as for those few Karakuls that have been gotten into Germany and Austria, I am sorry to say that they do not even deserve mentioning.

It is the practice of the Russian societies to raffle off all specimens imported, which makes it impossible for their members to put even a short distance between one ram and another. In fairness, however, I must state that last year Messrs. Karpoff and Ganko made the first effort really worth mentioning, when they went as far as to the steppes Djom-Boss in the district of Kerki, some 200 miles from Tjardjui, and brought out quite a flock; but most of them had the undesirable short underwool and again, they were raffled off amongst the members of the Poltava Agricultural Society. I was surprised when I found that practically none of Russia's breeders understood the danger due to the presence of fine wool.

In Mr. Ganko's excellent report, delivered to the Russian Sheep Congress at Moscow last October, which I attended, no mention was made of this all important fact until I reported the result of my tests with finewool American sheep.

HINDRANCES TO FOREIGNERS.

Providing a Russian subject can secure permission from the Russian Department of Agriculture, and the Department of Foreign Affairs gives its consent, and providing his majesty the emir permits him to enter the Khanate, it is only a matter of being properly financed, and a limited number of Karakuls can be obtained, although, after all, the proper Jigit (an official of the district governor, who can do what he pleases with his subjects) is indispensable.

A foreigner can not get out Karakul sheep for the following reasons: (1) Even after securing permission from the Russian war minister to enter west Turkestan, which often means weeks of delay in St. Petersburg, he is not permitted to go very far away from the railway station, and he absolutely can not go to Takta Bazar, Kushk, Kerki, Termez or Karshi.

(2) The emir does not permit a foreigner to export Karakul sheep, and should he get them into European

Russia through a third party, he can not get them out lawfully.

(3) Most European countries prohibit the importation of live stock from Asia, on account of certain diseases, and especially is that true of England, the United States and Canada, where it is nearly impossible to secure a permit to land them. Even where an exception is made for purely experimental or exhibition purposes, the most rigid quarantine is imposed, lasting for months. Those foreigners who have travelled in Russia with proper credentials showing them to be interested in scientific research work will testify to the great courtesies shown them by Russian officials, and this explains why I have been able to get out a few head of Karakuls. But on account of the mistakes which I made in my first and, to some extent, in my second importation (for I suspect that some of the animals in the latter were related, after all), I hope to secure permission to export a few more sheep direct from Bokhara. During my last visit there, I did not learn certain facts about the source of the Karakuls which I bought until after I had used the permit given me by the U. S. Department of Agriculture, and had already forwarded to America the sheep which I later discovered might possibly be inbred, in some cases at least.

I expect soon to leave for a third trip to Asia, where I hope to secure permission from the emir to export a few more sheep for scientific experiments, and I trust that this time I will be permitted to make my own selections over a vast area, thus being able to put such a large distance between the source of one animal and another, that the chance of getting related stock will be remote and negligible. Of course, as a preliminary, everything depends on my getting a permit[6] from the U. S. Department of Agriculture to bring the sheep into this country—a privilege that has already been denied to me by the chief medical officer of the Canadian quarantine department at Ottawa.

Though not permitted to enter the forbidden zone of Bokhara and Transcaspia last March, I hope to be able to do so this time, as it is the opinion of the Russian Department of Justice that since I became naturalized in America without the permission of the Russian government, I am, technically, still a Russian citizen, who needs but return with a Russian passport in order to enjoy all the rights and privileges of Russian citizenship.

[6]Dr. Young secured the desired permit and left for Asia in February, after completing this paper.—THE EDITOR.

Quail Breeding

Experiments in the propagation of game birds have been successfully conducted this summer on the estate of William Rockefeller at Tarrytown, N. Y., under direction of Herbert K. Job, State Ornithologist of Connecticut. A man secured by Mr. Job was employed and carried on the work under his direction. No attempt was made to raise a large number of any one species, the purpose being to work out a practicable system for private estates. About 200 young bobwhite quail were reared to maturity, with trifling loss and no outbreak of any disease. The pheasant rearing was successful. A few broods of the Hungarian partridge were raised, and of the tinnamou, a curious South American game bird, also wood ducks and other waterfowl, and a considerable flock of guinea fowl. Under Mr. Job's system the young were hatched by bantams and the broods allowed free range by day, being shut in at night. They were scattered over the great estate, and the young broods of game birds with their foster mothers were an attractive feature all summer on the wide lawns. Trapping and other destruction of vermin was at the same time carried on.—Forest and Stream.

THREE NEW NUTS

Pili Nut From Philippines and Paradise Nut From Brazil Becoming Favorites in American Markets—Queensland Nut Promises to be a Valuable Commercial Nut Well Adapted to Southern California and Regions of Similar Climate.

THE EDITOR

FOLLOWING an increase of interest in nuts as food among consumers, and in nuts as a crop among horticulturists, several new sorts have appeared on the markets of the United States, and by their excellence give promise of attaining considerable commercial importance. The best known of these is probably the Pili nut of the Philippines, which is now commonly sold throughout the United States at about twenty-five cents a pound, although it has been in the trade for only a few years.

Disregarding some confusion in nomenclature, it appears that the Pili nuts of commerce are the fruit of *Canarium ovatum* and *C. luzonicum* of the Philippines and to a slight extent of *C. commune* of the Dutch East Indies, belonging to the natural order Burseraceae. The genus contains a hundred or more species, and is of Indo-Malayan origin, but has outposts in Africa, China and Australia. It hardly appears probable, from its distribution, that it is adapted to culture in the United States, but it might be made a valuable crop in Central or South America, since in addition to nuts the trees yield a valuable resin, the "gum elemi" of the pharmacopeia, whose stimulating properties are valued in plasters and ointments.

"The texture of the kernel," Barrett[1] remarks, "is almost ideal: it is exceedingly light without being spongy, brittle without being hard, and highly flavored without being oily. It is so easily digested that a kind of infant food is said to be prepared from it, the blanched kernels probably being pressed to remove excess of oil, and then ground.* * * Even the pulpy husk of thoroughly ripe nuts is eaten by Filipinos in some districts.

"It appears that nowhere in the Philippines is the Pili actually cultivated, although in the Moluccas a species which may also occur in Mindanao (*C. commune*) is actually under cultivation."

BREAD MADE FROM THE NUTS.

The nuts of the latter species, although little different from the Pili (*C. ovatum?*) and perhaps sold in the United States under the same name, are in the East known as Java Almonds. Hogg says[2] the tree attains a height of 50 feet, and its nuts furnish an important article of food to the natives; "but they are considered very unwholesome if eaten fresh, which is known by the exterior pellicle being of a pale white color with purple streaks, instead of reddish; and then they cause dysentery and diarrhoea. They are eaten both raw and roasted, and in Amboyna they are converted into bread, which is made in rolls about a yard in length and one inch thick; they are also made into a sort of marmalade. An oil is expressed from them which is used at the table when fresh, and in lamps when stale." The fruits of other species are pickled and eaten like olives.

The oil of commerce, known as Java Almond oil or Canary oil, is secured from a number of species,[3] which are sometimes planted as shade in nutmeg plantations, although the nuts are usually

[1]Barrett, O. W., in Philippine Agricultural Review, November, 1912.
[2]Hogg, Robert. The Vegetable Kingdom. 254. London, 1858.
[3]Krause, M Eine neue Fettfrucht aus Deutsch Neu Guinee. Tropenpflanzer, XVII, 3, 147, 1913

THE PILI NUT OF THE PHILIPPINES.

Commercially it is the most important new nut which has appeared on the American market during recent years. The nuts (here shown natural size) have an excessively thick shell, which demands attention from some tropical plant breeder; but the kernel is so delicate and nutritious that an emulsion of it is frequently used as a substitute for milk in bringing up infants. A valuable commercial oil is pressed from them, while the resin of the tree is the "gum elemi" of pharmacists, used in plasters and ointments. The nuts shipped to America are mostly from forest trees, the genus not being cultivated in the Philippines, although it is in the Dutch East Indies. (Figure 14.)

gathered from wild trees. Pastrovitch found[4] that 65.73% of oil could be extracted with petroleum ether or 56.12% by simple pressure, and he describes the oil as "bright yellow, odorless, of a pleasant, pure taste; it might very well be used as a food fat."

THE PARADISE NUT.

Somewhat similar to the Pili nut is the Paradise nut, a near relative of the more common Brazil nut, and grown in Brazil, Venezuela and Guiana. Its botanical genus is Lecythis, and the species usually shipped to this country is said to be usitata, but it seems probable that several species are used, the principal one being that usually known as *L. zabucajo*. The native name is Sapucaia, and under this name it is sold in Europe, the designation "Paradise nut" appearing to have originated in New York.

The natural order of Lecythidaceae, which embraces not only the Paradise nuts, but the Brazil nut (*Bertholletia excelsa*) and the Cannon Ball tree (*Couroupita guianensis*) is remarkable for the character of its fruit, the seeds being enclosed in hard, woody "pots" or "urns," provided with lids which fall when the fruit is ripe, allowing the seeds or nuts to drop to the ground. The receptacle of the Brazil nut is fairly familiar; that of the Paradise nut, shown in the accompanying photograph, is six inches in diameter, and the lid two inches across. It is frequently called "monkey pot," as it is alleged that the monkeys are able to open it while still on the tree. Barring such agency, when mature the lid opens by itself, the nuts drop, and the pot remains on the tree for a year or two.

FORMERLY A STOCK FOOD.

The tree is common in its habitat, but it is only in recent years that the nuts have attained a commercial value. Writers early in the last century declare they were used only for stock food, much as acorns in the United States, and it is even alleged that the vernacular name, "sapucaia," means "chicken," and points to their former use for fattening poultry. In earlier days, however, there is evidence that they were highly esteemed by the Indians as food, although William Piso, who testifies to this, declares that excessive indulgence in them causes baldness.[5]

They have always been somewhat scarce, because of the fondness of monkeys for them; and for this reason, and the present commercial demand, they now bring three times as high a price as the Brazil nut—75 cents a pound. The preference for them is due to the fact that the meat is considered of a finer flavor, as well as more digestible. The shell, moreover, is thin, in pleasing contrast to that of the Pili nut, which has a way of putting lightly-made nutcrackers quite out of commission.

Most of the 30 or 40 species of Lecythis attain a large size and furnish excellent timber, which is considered particularly resistant to the attacks of teredos and barnacles, in salt water. *L. ollaria*, most commonly known as the Monkey Pot Tree, is said to resemble an elm in appearance. Its bark can be separated into nearly a hundred layers, about the thickness of writing paper, which the Indians commonly use in rolling cigarettes. Its seeds contain 39% of oil; the pot which holds them is widely used as a kitchen utensil. The seeds of *L. lanceolata* are considered narcotic, and usually roasted before they are eaten; those of *L. amara* are too bitter to eat, but furnish a valuable industrial oil.[6] The species is not, to my knowledge, under cultivation, but may eventually repay such culture.

THE QUEENSLAND NUT.

The Queensland nut is more interesting than either of the two preceding, to

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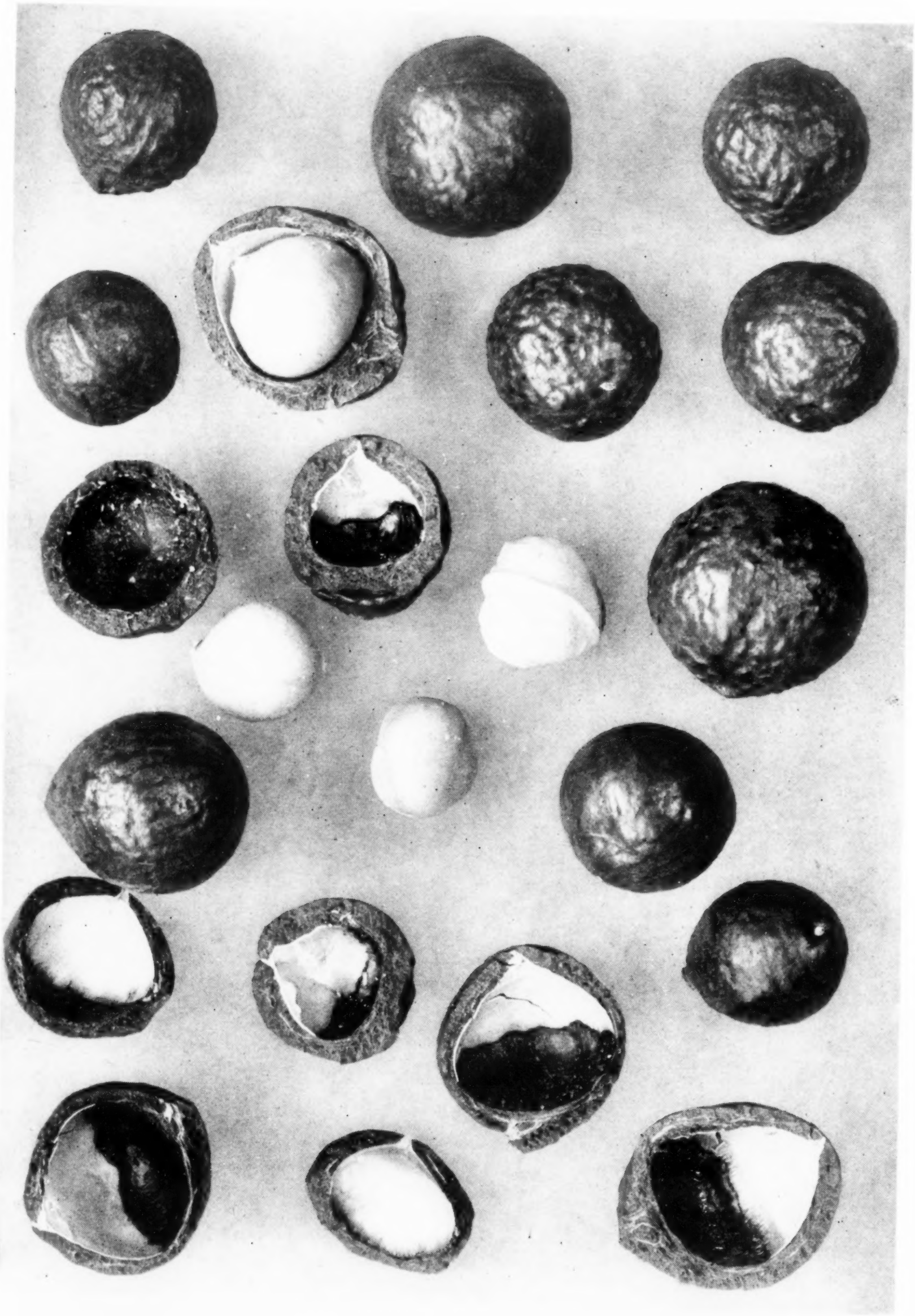
[4]Pastrovitch, P. Chem.-Zeitung No. 65, p. 781, 1907.

[5]Gulielmi Pisonis Commentarium in Iacobi Bontii Historiae Naturalis et Medicae Indiae Orientalis Liber VI, p 135, Amsterdam, 1658. He calls the nut Iaçapucaio and distinguishes two species. "In (calyces)," he says, "continentur nuces jucundi saporis * * * & gratissimum incolis aeque & animalibus suppeditunt alimentum. Sapore & excellentia Pistaceis adaequantur & venerem sopitam dicuntur excitare. Potiones & pultes, tam ad Medicinam quam ad epulas ex illis comparantur."

[6]Flora do Brazil, p. 65.

THE PARADISE NUT OR SAPUCAIA.

It is one of the "monkey-pot" nuts of the Spanish Main and the forests of the Amazon, and is now considerably sold in the United States at 75 cents a pound. The nuts, which look much like gherkin pickles, are contained in a receptacle six inches across, furnished with a neatly fitting lid, which drops when mature, allowing the nuts to fall to the ground, while the pot remains on the tree, unless it is brought down by the Indians to serve as a household utensil. The nuts are of a rich but delicate flavor, and easily digested. (Figure 15.)



THE QUEENSLAND NUT.

A delicious nut of Australian origin, which is creating much interest in California. It is resistant to drouth and fairly resistant to frost, and promises to be of much value commercially in the warmer parts of the United States. Extensive plantings are being made, but mostly in an experimental way, or for ornamental purposes. Thickness of shell is the only defect of the nut, and this is one that is easily amenable to improvement by selection. In texture and flavor, the kernel resembles that of a Brazil nut, and is universally liked; small shipments from Queensland to London are said to have been sold at $2.50 a pound. Photograph natural size. (Figure 16.)

the extent that it offers promise of industrial value in Southern California and some other parts of the United States, where it is already being widely planted on an experimental scale. Botanically it is *Macadamia ternifolia*, of the order Proteaceae, and takes its common name from its home; it is also said to be called the Australian hazelnut, although not so known in this country.

The fruit is a drupe with fleshy exterior; the brown kernel (the nut itself) has a shiny surface that is particularly attractive. Its meat closely resembles that of the Brazil nut, but is richer and better flavored; like the Pili nut, it has the disadvantage of a very hard shell, which selection alone will reduce. In flavor it is first-class—small shipments made from Australia to London are said to have brought twelve shillings a pound on the Covent Garden market. Few are sold in California, because of the present small production.

The tree is moderately frost resistant, and requires very little care or water, wherefore it is highly prized in semi-arid localities. Despite this, it will, like other plants, give better results if well irrigated. As the bush or small tree which bears it is distinctly ornamental, and has the advantage of evergreen leaves, it is much favored for planting as an ornament. For this purpose, as well as for its nuts, it can be recommended without hesitation in Southern California and similar regions where its character exactly fits it for the needs of the rapidly increasing number of people who believe that economic value and novelty should be combined with ornamental qualities, in landscape gardening.

Increasing the Richness of Milk

The possibility of increasing, with economic advantage, the average fat content of cow's milk, is discussed by Nils Hansson in the Kungl. Landibruks-Akademiens Handlingar och Tidskrift, LII, 5, Stockholm, 1913. After discussing the results of feeding experiments carried on for twenty-five years at the Central Experiment Station of Sweden, where he is chief of the animal husbandry section, the writer summarizes the results of his investigations on the influence that the choice of the bulls has on the fat content of the milk. He concludes:

1. It is possible to increase the percentage of fat content of the milk of a herd, with economic advantage, by a judicious selection of the breeding animals.
2. By dividing a herd into families of descendants of the sires and of the dams, the influence of each animal on the development of the qualities of the herd may be better demonstrated.
3. The influence of the males is demonstrated by the average production of all their female descendants, or still better by a comparison of the average production of their daughters with that of the dams of these daughters when they were of the same age.
4. The influence of the bulls on the percentage of fat content of the milk of their female descendants depends upon the qualities of the females of the preceding generations.
5. The influence of the cows appears in the fact that a bull possessing a certain genotype percentage of fat cannot increase the percentage of fat in the milk except in the daughters of cows inferior to him in the percentage of fat content, whilst the daughters of the same bull out of cows yielding richer milk will have a percent age of fat inferior to that of their dams.
6. The males and the females transmit to their descendants the percentage of fat which they themselves have inherited from their ancestors, the male and the female having, as it appears, an equal influence on condition that they represent the same constancy of results in this respect. But owing to its larger number of descendants, the male has a greater influence on the development of the herd.

INFLUENCE OF SOURCE OF SEED

Many Minor Characters Dependent on Habitat and Easily Changed Under New Conditions—Apparent Example of Inheritance of Acquired Characteristics In Pines Crippled by Growth in Poor Soil.

ARNOLD ENGLER, [1]

in Mitt. der Schweiz. Centralanstalt. f. d. forstiche Versuchswesen,

(Contributions from the Swiss Central Station for Forest Research) Zürich, 1913; 153 pp., 12 tables.

FOR many years foresters have been occupied with the question whether the characters of climatic races of trees are hereditary, and whether they persist for longer or shorter periods in seedlings which have been raised under other climatic conditions. In many different countries experiments and observations have been devoted to this practically important question, and the work before us is an important contribution to the subject.

More than 70,000 pine[2] seedlings were grown at 12 stations in Switzerland at successive altitudes from 370 to 1980 meters, the seeds having come from localities in northern Europe, in the Alps, in western Russia, in southern France, and from intermediate localities. The seedlings are now from six to seven years old. From data obtained from these cultures and from other observations the author is able to show that characters such as the shape of the scales of the cones, the resinous coating of the buds and the age limit of the needles are in large measure dependent upon the habitat and soon undergo change when the plants are grown in another climate On the other hand he demonstrates that there is an "innate physiological disposition" of the plant which is preserved by its progeny in a foreign habitat and which is expressed, for example, in a poorer growth in an unsuitable climate. Thus, the poor form of the pines grown in Livonia from seed from southwestern Germany is not due to the fact that the seeds came from inferior trees but from the inability of the race to adapt itself to the climate of Livonia. The pine of western Russia, the Riga pine, possesess on the other hand a high degree of physiological adaptability and consequently retains its good habit of growth even in southern France. In contrast to this, pines from middle or northern Sweden when grown no farther from their home than northern Germany are inferior to the native race in growth and in shape.

CORRELATION FOUND.

In the plantings at the Swiss station it was found that in seedlings one to two years old as well as those six to seven years old, the growth in height decreased with increasing altitude or increasing latitude of the locality from which the seed came. An exception is afforded by six or seven-year old seedlings of the Engadine pine (*Pinus silvestris engadinensis*) which even at the lower altitude made a much finer and more vigorous growth than seedlings of the same age of the common pine (*Pinus silvestris*), obtained from lower altitudes in the Alps. At the higher stations this variety surpassed all the other races included in the experiment. Among these the plants grown from seeds collected in France, in southwestern Germany and in northern Switzerland showed an especially poor habit of growth, and those from the two latter localities suffered from dying of the tips because they continued growth too late in the fall. Especial interest attaches to the observation that the seeds of pines which had been crippled by un-

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[1]Translation of a review by Büsgen in "Zeitschrift für Botanik," Vol. 5, p. 838, 1913.

[2]*Pinus silvestris* is the species referred to throughout this review, unless otherwise mentioned.

favorable soil conditions gave rise to crippled plants in the experimental stations, so that here we have apparently an example of the inheritance of acquired characters.

Pines (*P. vulgaris*) two to six years old, grown from seeds produced by trees which in turn had been grown from seeds collected 30 to 40 years ago at low elevations and planted at high altitudes, were distinct from the normal lowland pines of this species only in the smaller proportion of large individuals. The parent trees had presreved in the new climate the habit of growth of their original habitat and had transmitted it to their progeny. In this case "after effect" had become "heredity."

EUGENICS IN THE COLLEGES

CORNELL UNIVERSITY is organizing a course in Genetics and Eugenics to be given in the early part of 1914 by a number of specialists.

There are now 44 colleges giving either a complete course in eugenics or some lectures on it as part of another allied course; 15 in the East, 14 in the Middle West, four in the South. Sixteen teach eugenics in their zoology department, 11 in the biology department and 11 in the sociology department.

The following is a partial list of courses in eugenics (often combined with genetics) given in the colleges of the United States last year.

Agricultural College of Utah	Zoology Department.
Alfred University	Biology Department.
Barnard College	Zoology Department.
Bryn Mawr College	Biology Department.
Carnegie Institute of Technology (Margaret Morrison Carnegie School).	Department of Science.
Central University of Kentucky	Biology Department.
Colorado Agricultural College	Entomology and Zoology Department.
Cornell University	Plant Breeding Department.
Dakota Wesleyan University	Biology Department.
Dartmouth College	Sociology Department.
Denison University	
Elmira College	Sociology Department.
Harvard University	Zoology and Psychology Departments.
Knox College	Biology Department.
Marietta College	Biology Department.
Massachusetts Institute of Technology	Biology Department.
Middlebury College	Zoology Department.
Oberlin College (Summer Session)	Sociology Department.
New York University	Sociology Department.
State College of Washington (Series of Lectures).	
Syracuse University	Zoology Department.
Rush Medical College (University of Chicago)	Zoology Department.
Tulane University	
University of California	Zoology Department.
University of Chicago	Department of Political Economy and Zoology Department.
University of Colorado	Biology Department.
University of Florida	Sociology Department.
University of Illinois	Zoology Department.
University of Minnesota	Animal Biology Department.
University of Nebraska	Sociology Department.
University of New Mexico	Biology Department.
University of North Dakota	Sociology Department.
University of Oklahoma	Zoology Department.
University of Pennsylvania	Sociology Department.
University of Pittsburgh	Department of Biology, Sociology and School of Education.
University of South Carolina	
University of Southern California	Sociology Department.
University of South Dakota	Human Economics.
University of Tennessee	Zoology Department.
University of Texas	Zoology Department.
University of Washington	Department of Political and Social Science and Department of Zoology.
Washington University Medical School.	
Western College	Biology Department.
Western Reserve University	Sociology Department.